1940

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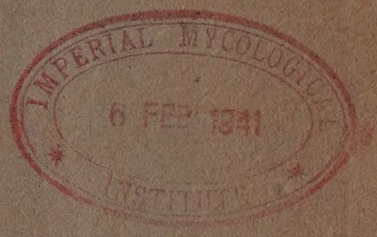
QUEENSLAND.



FORTIETH ANNUAL REPORT

OF THE

Bureau of Sugar Experiment Stations

REPORT OF THE DIRECTOR

TO

THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

(As required by "The Sugar Experiment Stations Acts, 1900 to 1938").

PRESENTED TO PARLIAMENT BY COMMAND

BRISBANE:

BY AUTHORITY: A. H. TUCKER, GOVERNMENT PRINTER.

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FORTIETH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS.

Director's Report.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Fortieth Annual Report of The Bureau of Sugar Experiment Stations, covering the period 1st July, 1939, to 30th June, 1940.

H. W. KERR,
Director.

Brisbane, 1st November, 1940.

GENERAL.

The growing season for the 1940 cane crop was one of alternating extremes. The dry spring months of late 1939 were followed, in general, by excessively heavy wet season rains, so that water-logging of fields of backward cane was common, and the crop was handicapped due to this cause. The magnitude of the estimated crop is therefore surprisingly good, having regard for the season.

In the far-Northern districts, very little rain fell during the latter half of 1939; at Meringa, this yielded a total of 3.63 inches. Many fields possessed a drought-stricken appearance when the wet season rains arrived. Canes on the higher lands benefited from the prolonged wet conditions, but all crops arrowed freely, in common with the experience of other districts of the State.

The Central districts experienced a somewhat similar season. In these parts, the wet season was short, and growth was checked after the last favourable rain period of early April.

In the Southern districts, the crop was produced under conditions very similar to those of the Central districts. A prolonged dry autumn was followed by damaging frosts in the winter.

The cyclone season also left its mark on the crop. The areas from Mackay to Cairns were affected, in part, by one or more cyclonic storms. The most severe damage occurred in the Burdekin district, where an abnormal flood, accompanied by wind, was responsible for much crop loss. The earlier crop estimates in these parts had therefore to be revised very considerably.

CROP YIELD, 1939—CROP ESTIMATE, 1940.

The following table shows the individual mill crushings for the 1938 season, and the estimated crops available for harvest during 1939:—

1939 Crushing.	Mill.	1940 Estimate.
Tons.		Tons.
130,063	Mossman	137,000
212,011	Hambledon	225,000
271,008	Mulgrave	260,000
216,711	Babinda	240,000
181,315	Goondi	192,000
254,195	South Johnstone	250,000
196,734	Mourilyan	187,000
302,594	Tully	280,000
319,297	Victoria	240,000
295,071	Macknade	240,000
124,200	Invicta	105,000
198,556	Pioneer	184,950
243,815	Kalamia	160,000
272,024	Inkerman	216,000
164,533	Proserpine	160,000
96,733	Cattle Creek	85,000
242,894	Racecourse	215,000
218,942	Farleigh	211,000
128,010	North Eton	130,000
230,207	Marian	185,000
245,958	Pleystowe	218,500
231,396	Plane Creek	218,000
91,127	Qunaba	94,000
191,197	Millaquin	240,000
224,075	Bingera	280,000
231,981	Fairymead	290,000
60,623	Gin Gin	71,150
211,836	Isis	261,500
62,017	Maryborough	65,000
50,379	Mount Bauple	48,000
119,312	Moreton	149,500
17,711	Rocky Point	16,500
2,296	Eagleby	2,600
6,038,821	Total	5,857,700

ESTIMATES OF SUGAR YIELD, 1940 CROP.

The preliminary estimate of the cane crop which will be available for harvest in Queensland during the 1940 season is 5,857,700 tons. This is substantially below the actual yield for 1939, but is, nevertheless, very much higher than normal. At the present juncture it is doubtful whether this tonnage will be realised, due to the heavy arrowing of the crop in most districts, combined with lighter crop yields following the very dry autumn. On the other hand, the crop will probably show a high sugar content, and this factor will compensate in some measure.

Allowing for that proportion of the crop in the Southern areas which will probably be allowed to stand over until 1941, it is anticipated that some 810,000 tons of raw sugar will be manufactured. Such a tonnage, if realised, will be second in magnitude only to the record production of 1939—891,422 tons.

In addition, it is estimated that the New South Wales mills will crush some 310,000 tons of cane, from which approximately 39,000 tons of sugar may be expected. The estimated total Australian production for 1940 may therefore be placed at 850,000 tons.

STATISTICS OF THE 1939 CROP.

The yield of raw sugar in Queensland for the 1939 crop was 891,422 tons* of 94 n.t. This was easily an all-time record tonnage, exceeding that of 1938 by some 113,000 tons.

The following table shows the geographical distribution of the crop for the past five years, as between "northern" and "southern" cane districts:—

Sugar Production, 1935–39.

District.	1935.	1936.	1937.	1938.	1939.
	Tons.	Tons.	Tons.	Tons.	Tons.
North of Townsville	258,958	333,615	373,692	328,301	351,267
South of Townsville	351,368	410,646	389,633	449,835	540,155
Total	610,326	744,261	763,325	778,136	891,422

The progressive upward trend in production in the central and southern areas of the State has thus been maintained, and over 60 per cent. of the record tonnage was produced from areas south of Townsville.

These results are due in part to each of the following causes:—(1) Planting of superior cane varieties, (2) elimination of loss due to diseases, (3) increased acres cultivated, and (4) the adoption of better methods of cultivation and more rational use of manures.

ACRES HARVESTED AND ACREAGE YIELD.

The total area harvested for milling purposes in 1939 was 261,047 acres, which is almost exactly 10,000 acres greater than that of the previous season. The acreages under plant, ratoon, and standover crops were as follows:—

	Acres.
Plant cane	102,759
Ratoon cane	137,590
Standover cane	20,698
Total	261,047

* This is slightly in excess of the figure quoted on page 2, as it includes "local" sales which are additional to that acquired by the Sugar Board.

The yield of cane per acre crushed was 23.1 tons, while the average sugar yield was 3.41 tons. Both these figures establish new records for Queensland, and the yield of sugar per acre has now exceeded 3 tons for four consecutive years.

The following were the yields of cane and sugar per acre in the respective sugar districts, during 1939:—

Acreage Yields by District.

District.	Tons Cane per acre.	Tons 94 n.t. Sugar per Acre.
Mossman-Ingham	23·2	3·43
Lower Burdekin	29·5	4·71
Proserpine	15·0	2·36
Mackay-St. Lawrence	19·7	2·99
Bundaberg-Gin Gin	28·0	3·71
Maryborough-Childers-Gympie	22·6	3·10
Nambour-Beenleigh	25·3	3·34
State Average	23·14	3·41

The following table gives the crop statistics for Queensland for the past ten years:—

Table showing Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre-Yields, and Quality of Cane, 1930–1939.

Year.	Acres Cultivated.	Acres Harvested.	Total Yields.		Yields per Acre.		Tons Cane to 1 Ton Sugar.
			Cane.	Sugar.	Cane.	Sugar.	
			Tons.	Tons.	Tons.	Tons.	Tons.
1930 ..	296,070	222,044	3,528,660	516,783	15·89	2·33	6·83
1931 ..	309,818	233,304	4,034,300	581,276	17·29	2·49	6·94
1932 ..	291,136	205,046	3,546,443	514,085	17·30	2·51	6·90
1933 ..	311,910	228,154	4,667,028	638,734	20·46	2·80	7·31
1934 ..	303,916	218,426	4,269,991	612,570	19·56	2·80	6·97
1935 ..	314,700	228,515	4,220,267	610,326	18·47	2·67	6·92
1936 ..	338,686	245,152	5,171,516	744,261	21·10	3·04	6·94
1937 ..	348,840	249,683	5,132,934	763,325	20·56	3·06	6·73
1938 ..	347,199	251,064	5,342,085	778,136	21·28	3·10	6·87
1939 ..	*	261,047	6,038,821	891,422	23·14	3·41	6·77
True Average for 10 Years ..		234,244	4,595,205	665,092	19·62	2·84	6·91

* Not available.

Average Area Harvested per Farm.

The following figures show the average acreage *harvested* by cane planters in Queensland for the 1938 crop:—

	Acres.
Cairns to Townsville	48
Ayr to Mackay	35
Bundaberg to Bauple	20
Nambour to Beenleigh	8
State average	32

The average area harvested per planter was 32 acres, which is one acre higher than that of the previous year.

Molasses Produced.

The following figures supplied by the Government Statistician show the manner in which the molasses produced in 1939 was disposed of:—

	Gallons.
Sold to distilleries	9,581,241
Burnt as fuel	3,834,653
Used or sold for feed	4,727,170
Sold or used for other purposes	188,889
Used as manure	4,295,289
Run to waste	457,541
Total	23,084,783

MAFFRA BEET FACTORY.

The following data in respect of the Maffra Sugar Factory, Victoria, are supplied through the courtesy of the Manager:—

Crop Yields, 1940 Season.

Area harvested	3,950 acres
Beet purchased	42,898 tons
Beet sliced	41,890 tons
Average sugar content	18·86 per cent.
Sugar produced	6,280 tons
Price paid for beet	46/–
Average yield beet per acre ..	10·86 tons
Average yield refined sugar per acre	1·59 tons

1939 SUGAR VALUES.

The proportion of the 1939 sugar crop manufactured in Queensland, which was required for consumption and use in the Commonwealth of Australia, was declared at 49.8495 per cent., and for that export at 50.1505 per cent. These proportions are exclusive of the "excess" sugar produced by mills in excess of their allotments under the Peak Year Scheme.‡ The excess sugar produced for the 1939 season was 168,520 tons, as compared with 163,943 tons for the 1938 crop.

The price payable for the sugar required for consumption and use in Australia was declared at £23 12s. 6d. per ton of 94 net titre. The net value per ton of 94 net titre sugar sold abroad was £10 7s. 6d., which is £2 3s. 3d. per ton higher than the 1938 figure. The average price paid to those Queensland mills which did not produce "excess" sugar was £16 19s. 7d. per ton, compared with £16 19s. 1d. for the previous season.‡ The average value of *all* sugar was £15 15s. 3d., which is the highest recorded since 1935.

The following table summarises production and consumption figures and sugar values since the year 1924, when the first large surplus was produced:—

Year.	Total Sugar Production at 94 n.t.	Tons Sugar Exported.*	Average Australian Price.	Average Export Price.	Average Price, No. 1 Pool Sugar.	Average Price, *all* Sugar.
	Tons.	Tons.	£	£	£	£
1924	409,136	74,000	26·0	21·0	26·0	26·0
1925	485,585	219,000	26·5	11·3	19·5	19·5
1926	389,272	74,777	26·5	14·9	24·5	24·5
1927	485,745	152,384	26·5	12·1	22·0	22·0
1928	520,620	186,703	26·5	10·5	20·9	20·9
1929	518,516	197,000	27·0	9·9	20·3	20·3
1930	516,783	203,605	27·0	8·3	19·7	†19·5
1931	581,276	291,802	27·0	9·4	18·3	18·0
1932	514,027	189,733	25·0	8·3	19·3	18·8
1933	638,734	305,687	24·0	8·0	17·2	16·2
1934	612,570	277,336	24·0	7·6	16·5	15·5
1935	610,326	298,202	24·0	7·9	16·9	16·2
1936	744,261	409,400	24·1	7·95	17·1	15·2
1937	762,794	430,523	24·0	8·3	17·55	15·3
1938	776,810	443,386	24·0	8·2	16·95	15·1
1939	890,896	515,792	23·6	10·4	17·0	‡15·75

* Bagged sugar. † Peak Year Scheme first operated in 1930.

‡ Revised Mill Peak schedule first operated in 1939.

Total Value, 1939 Sugar Crop.

The total value of the 1939 Queensland crop was £14,042,000—an all-time record, and higher than the 1938 value by £2,304,000.

ECONOMIC REVIEW.

The 1939 crushing season was launched in an atmosphere of uncertainty. The cane crop available for harvest was estimated at more than 6 million tons—the largest ever produced. With the operation of the international export quota scheme, it appeared that less than 50,000 tons of excess sugar could be acquired and disposed of, over and above the basic mill peak aggregate of 737,000 tons. The probable unmarketable excess was thus some 100,000 tons of raw sugar.

At this period the grave international situation was rapidly deteriorating, and cumulated in the declaration of war early in September. This brought about a substantial change in the economic situation notably insofar as the British Empire was concerned. Besides being released, as belligerent countries, from the control of the International Sugar Agreement, the British Government embarked on a policy of Empire purchasing, which ultimately gave the Australian sugar producer the unexpected opportunity for disposing of his entire 1939 production. The transaction was, of course, contingent upon the availability of shipping for the transportation of raw sugar to those part of the British Empire where it was required.

The benefits of such a liberalised marketing offer was fully availed of by all producers from Mackay north; the Southern Queensland growers, though harvesting in excess of normal limits, still elected to pursue their policy of standing over portion of the excess cane until the following year. The net export value realised for sugar sold after the outbreak of hostilities was about £10 10s. per ton, which is substantially better than the average price of recent years.

The aggregate sugar tonnage manufactured was 891,000 valued at over £14,000,000. Both figures constitute record high values for Queensland sugar production.

While the war was thus initially responsible for easing what would doubtless have been a most difficult position, there are definite indications that the continuance of hostilities may create just as difficult problems for the future. The early estimates of the 1940 cane crop suggest that the tonnage which will be available for manufacture is capable of yielding well over 800,000 tons of sugar, and the reduction on the 1939 harvest is due only to the less favourable growing season experienced. While it has been announced that the Empire purchasing plan may be able to absorb the entire volume of production during 1940, the availability of shipping is causing no little concern. It was anticipated that the sugar manufactured early in the crushing season could be got away without difficulty, but it appeared probable that a large proportion of that manufactured later in the season would have to be held in storage for some months. Many of the mills were forced to store portion of the 1939 crop until the autumn of 1940, and steps have since been taken to provide increased storage capacity for this and subsequent years. Doubtless the British Government will utilize all available ships

in such a manner as to grant preferential rights to those commodities in most urgent demand. In this respect it would appear that stocks of sugar in England have been well conserved, and there is no suggestion of any immediate shortage of this commodity.

The industry recognises that the outlook is obscure, and the need for rationalisation of production is probably more acute than ever before. In most mill areas of the State a sincere effort has been made to implement the 1939 Amendment of the Regulation of Sugar Cane Prices Acts, which makes provision for the formulation of a scheme to control production on individual farms within the limits of the present mill peak tonnage. To devise a basis which is acceptable to the large majority of canegrowers in any area is, of course, a task of some magnitude. This is inevitable, for an alternative scheme which favours one group of farmers must automatically react to the detriment of the rest.

However, it is encouraging to be able to record that something has been achieved in this respect. While a number of mill areas have allotted peak tonnages of cane (or sugar) to the individual suppliers, others have favoured control on a net acreage basis. The future alone will show which plan possesses the greater merit.

It must be admitted frankly that any form of production control is irksome to the primary producer. Even though he may have no special desire to increase his individual production, there exists the factor of intensification of agricultural methods which makes for a steady but progressive increase in acreage yield. While it may be urged that the area cultivated should be reduced in proportion to the increased production per acre, this would be offset by the natural gain in regional farming population from year to year, which normally prefers to be absorbed into sugar production rather than migrate to an area where other forms of primary industry are enjoying no greater measure of stability.

Considerations such as these have induced certain of the leaders of the industry to explore the possibilities of utilizing any such surplus production for purposes other than human consumption, as well as providing a safety valve in the event of the closing of the present overseas distribution channels which are at present available, during the period of post-war adjustment. The scheme of diverting cane juices or syrups for the purpose of fuel alcohol production seems to offer something in this regard.

Admittedly alcohol produced from farm crops cannot compete economically with imported fuel, so long as present supplies of petrol are available; but perhaps the manufacture of a proportion of the Nation's liquid fuel requirements from home-grown produce will provide scope for rationalisation in some fields of primary production which are at present facing a most difficult problem.

WORK OF THE BUREAU.

The detailed reports of the officers in charge of the several Divisions and of regional Experiment Stations will be found in the ensuing pages of this Report. The following comments summarise the more important general aspects of the activities of the Bureau for the year under review:—

Advisory Board.

Meetings.—During the year, two meetings of the Board were held in Brisbane—on the 14th December, 1939, and on the 8th March, 1940. In the absence of the Hon. the Minister, the Deputy Chairman (Mr. N. H. Wellard) presided over the March meeting.

Staff.—During the year further applications were called in an attempt to fill the vacancy of Mill Technologist. The position was advertised throughout the sugar world, and applications were received from several countries. The Board decided to appoint Mr. E. R. Behne, Senior Assistant Mill Technologist, to the position. It was recommended, further, that this officer be sent abroad for a period, when the international position has returned to normal.

In pursuance of the Board's policy to build up the field staff to a satisfactory working strength, further two cadets were appointed to the staff in the persons of Messrs. J. T. Elliott and E. V. Humphry. Unfortunately, the services of Messrs. E. J. Barke, G. A. Christie, and E. V. Humphry will not be available for a period, due to the enlistment of these officers with the fighting forces.

Mr. L. C. Home, who has served as a part-time officer of the Bureau, has now been appointed Laboratory Assistant, and is attached to the Brisbane chemical laboratory.

Disease and Pest Control.—Much of the time of the Board's meetings was occupied in considering matters affecting the more adequate control of pests and diseases. Most of the operations of the recently constituted Cane Disease Control Boards have fully justified the hopes which were held for the success of this project as an aid to disease control. In some areas it may justly be claimed that the vigilance of the boards has been responsible for a very marked improvement in the status of disease control, and in at least one area, it is probable that the major variety would have been lost to the growers if the control measures initiated by the Board had not been taken. These boards generally function in close co-operation with the Bureau; this is, of course, essential to their success and smooth working.

Non-approved Cane Varieties.—Despite the wide publicity which was given to cane-growers respecting their obligations under the Amending Act of October, 1938, and the year of grace which extended to all farmers who had planted non-approved canes, it was found that a large number of growers had failed to take adequate steps for the destruction of such fields or odd stools of canes.

To deal with these recalcitrants has imposed upon the field staff of the Bureau a particularly onerous task, the difficulties of which were magnified due to loss of staff through enlistment. The Board is very definitely agreed that the requirements of the Act shall be observed by all growers, if it is to be effective in its operation.

Amendment of Act.—Following representations by cane-growers' organisations, the Board agreed that where pests and disease control boards were operating in any area, they should be merged into one with full control over both phases. It is anticipated that the Act will be amended during the forthcoming Parliamentary session to take care of this. A further proposal deals with the period during which varieties "approved when planted but subsequently disapproved" may be cultivated, to meet the peculiar circumstances operating in certain districts.

Field Days.—Farmers' Field Days were conducted on each of the three Experiment Stations. The Mackay field day was held in April, in conjunction with the meetings of the Queensland Society of Sugar Cane Technologists, while the Meringa and Bundaberg functions were held in June. In each case the attendances were satisfactory.

New Cane Varieties.—The Board again endorsed the policy of the Bureau in seeking to improve the variety status of the industry, through the breeding and importation of new canes. During the year, certain new varieties bred in Queensland were released for trial purposes, while others are undergoing further observational tests prior to their being propagated on a commercial scale.

Publications.—During the year the "Queensland Cane Growers' Handbook" was issued, and a bound copy of the publication was forwarded to each canegrower in the State. This has been favourably received and commented upon by farmers generally. The "Cane Growers' Quarterly Bulletin" and "Technical Communications" have been continued, while a periodical "News Letter" is now being issued for the guidance of the mills and their technical staffs.

Utilization of By-products.—The Board devoted further attention to this subject, notably in reference to the attempts which are being made to utilize molasses as a substitute for bitumen in road construction. The efforts which are being made to expand the power alcohol industry in this State are also receiving the careful scrutiny of the Board.

Levy.—The levy for the year 1940-41 was fixed at ¾d. per ton of cane, as in the previous year.

Queensland Society of Sugar Cane Technologists.

The 1940 Conference of the Society was held in Mackay. The meetings were a complete success in every particular, and it would be difficult to over-estimate the value of this sister organisation in its contributions to the well-being of the industry. It is strongly supported by the technical officers of the Bureau, who contributed their quota of papers as in former years.

BALANCE-SHEET.

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM 1ST JULY, 1939, TO 30TH JUNE, 1940.

RECEIPTS.	£	s.	d.
To Balance, 1st July, 1939	18,114	15	6
„ Assessments	18,875	17	6
„ Endowment	7,000	0	0
„ Bundaberg Stations	1,138	10	0
„ Mackay Station	1,029	18	2
„ Meringa Station	634	7	11
„ Sundries	382	11	11
	£47,176	1	0

DISBURSEMENTS.	£	s.	d.
By Salaries	10,734	15	2
„ Contingencies	9,250	4	0
„ Bundaberg Contingencies	1,806	11	9
„ Mackay Contingencies	1,782	18	11
„ Meringa Contingencies	2,098	13	4
„ Balance, 30th June, 1940	21,502	17	10
	£47,176	1	0

STATEMENT OF RECEIPTS AND DISBURSEMENTS FROM INCEPTION OF FUND, 1ST DECEMBER, 1900, TO 30TH JUNE, 1940.

RECEIPTS.	£	s.	d.
To Assessments	268,958	7	4
„ Endowment	206,199	1	7
„ Sugar Experiment Stations	53,524	14	10
	£528,682	3	9

DISBURSEMENTS.	£	s.	d.
By Disbursements	507,179	5	11
„ Balance	21,502	17	10
	£528,682	3	9

C.C.S. FORMULA.

For the benefit of overseas readers of this report, we would point out that the measure of available sugar in cane (so-called Commercial Cane Sugar or C.C.S.) is defined as follows:—

$$\text{C.C.S. in juice} = \text{Pol in juice} - \frac{\text{Impurities in juice}}{2}$$

and C.C.S. in cane is calculated by the formula:—

$$\text{C.C.S.} = \frac{3P}{2}\left(1 - \frac{5 + F}{100}\right) - \frac{B}{2}\left(1 - \frac{3 + F}{100}\right)$$

where—P = pol in first expressed juice
B = brix in first expressed juice
F = fibre in cane.

DIVISION OF SOILS AND AGRICULTURE.

WORK OF THE BRISBANE LABORATORY.

MR. C. R. VON STIEGLITZ, Chemist.

Routine Analyses.—The following is a summary of the routine analyses performed at the Brisbane Laboratory for the period 1st July, 1939, to 30th June, 1940:—

Soils	547
Waters	29
Limes	11
Sugar Canes	11
Sugars	5
Molasses	2
Fertilizers	2
Miscellaneous	3
Total	610

The number of soil samples submitted by farmers for fertilizer advice, based on analytical results, increased 32 per cent. over the previous year's total, but farmers have not availed themselves of this free service to the extent anticipated. The addition of Mr. L. C. Home to the Bureau staff during the year has provided much needed help in handling more expeditiously soil samples forwarded for fertilizer advice, and has enabled more time to be utilized in special analytical studies and investigational work generally.

Laboratory Training of Field Officers.—Messrs. Smith, Elliott, and Humphry, Cadets, spent varying periods of instruction in the Brisbane Laboratory spread over approximately three months. In addition to gaining experience in the simpler analytical methods used for examining soils for plant food deficiencies, experiments were designed to exemplify the different physical, chemical, and biological characteristics of major soil types. These experiments were carried out by the Cadets themselves under the supervision of one of the chemical staff.

Investigational Work.—"Technical Communication" No. 10, 1939, "Basic Lead Acetate: Its Composition and Clarifying Qualities," by C. R. von Stieglitz, was published during the year. This publication lists analyses of twenty-two samples of basic lead acetate as used at Queensland sugar mills, and describes experiments employed for assessing the clarifying efficiency of such.

Soil Fertility Survey.—Work was continued on No. 6 Branch, South Johnstone area, in collaboration with Mr. Knust, instructor in cane culture, and the results will be mapped as previously. The further sampling of this area is to be discontinued, however, as the widespread application of mill by-products to these soils has rendered difficult a correct interpretation of the analytical results.

Investigations designed to furnish information on possible loss of soil nutrients through leaching, with particular reference to potash, were commenced early in the year. Soils from different districts are being sampled monthly and analysed for available potash and phosphate, and pH. Three soil types have been selected from the Innisfail district, one from Mackay, and one from Bundaberg.

LABORATORY METHODS OF ASSESSING AVAILABLE PLANT.

Nutrients.—The usual yearly comparison between the results of farm fertility trials and laboratory methods for determining available phosphate and potash was carried out, and resulted in fourteen out of seventeen, or 82 per cent., of the cases being correctly placed for both plant foods. Of these three exceptions, one soil showed high acidity which might well have been the limiting factor, and of the other two one was distinctly a border line case for phosphate. The results may therefore be regarded as highly satisfactory and confirm previous findings.

Nitrogen Availability.—Investigational work with a view to finding a suitable method of assessing the availability of this plant food in soils was continued, and a modification of Andrews' method of estimating the carbon dioxide produced by soil organisms, when certain optimum conditions are observed, shows promise of providing useful data. The method, however, would not seem to have the general application of the phosphate and potash tests, but when the soils are grouped according to districts and major soil types an examination of the available data suggests that a useful correlation will be established.

Damage to Soils by Cyclone.—The flooding of fields in certain areas of the Burdekin Delta, due to cyclonic weather in the early months of the year, resulted in extensive damage to crops and fields. Attention has been drawn to the extent of this damage by Dr. H. W. Kerr in the July issue of the "Queensland Cane Growers' Quarterly Bulletin." As a result of his inspection of the district, a number of soil samples was forwarded to Brisbane for chemical investigation; some represented the subsoils of fields which had suffered extensive erosion and others silt or sand which had been deposited on the original soil.

The result of the chemical analyses demonstrated that reserves of the soil plant foods, phosphate and potash, of these soils are quite satisfactory in the majority of cases, even in the sandy deposits, but the total nitrogen and nitrate producing power, except in the case of two silt deposits, are very low. The chief problems facing the farmer in these affected areas will be the regrading of the fields to permit irrigation practices to operate successfully and the most economic utilization of such irrigation where the sandy deposits are superimposed on the original surface soils.

NORTHERN SUGAR EXPERIMENT STATION, MERINGA.

Mr. R. W. MUNGOMERY, Acting Officer in Charge.

METEOROLOGICAL, AND NOTES ON CROP GROWTH.

However marked the contrast between the wet and dry seasons may have been during 1938-39, it was even more accentuated during the 1939-40 growing period. Although a total rainfall of 82·10 inches was recorded (and this very closely approximates the average) only 3·63 inches of this amount fell during the last six months of 1939, whilst the remainder fell on 107 wet days in the first half of 1940. This uneven distribution of rainfall could not have but a detrimental effect on growth; for in the spring months some of the fields were almost drought stricken, whereas during the autumn period other fields were waterlogged. Taken by and large, however, a crop only slightly below average resulted, for crops that were backward on the higher lands made satisfactory growth throughout the continued rainy season, whilst those that were forward on the lower ground were somewhat retarded in growth as the soil became saturated with water.

As a result of the copious rains that fell during the protracted wet season of 1939, soil moistures generally were good during the late winter months, and conditions were quite satisfactory for late plantings; but very cold weather was experienced in August, and in consequence, germinations were considerably delayed. In addition, high winds and the absence of any further useful rains soon caused a depletion of the soil moisture, and the cane was slow in coming away. Later, with the persistence of dry conditions, the young cane showed considerable distress until towards the end of October, when light showers fell. These were accompanied by a period of overcast weather, and little moisture was lost by evaporation; hence the young cane made a rapid recovery. Scanty falls were received at intervals during November, but these were insufficient to allow of vigorous growth taking place, and the absence of substantial rain during December, which was extremely hot, caused a severe check in the growth of all crops and they wilted badly. However, thunderstorms made their appearance early in January, and soil moistures were quickly replenished, so that from then onwards recovery was rapid and a vigorous growth was maintained.

On 18th February, this Experiment Station came under the influence of a cyclonic disturbance, and winds of gale force blew down trees and completely flattened some of the more advanced crops. Other damage occurred through some of the more vigorously growing varieties snapping off at the succulent internode just below the top, and this later caused considerable side shooting. Fortunately the disturbance was accompanied by very little rain, and the crops were generally not in a forward state, otherwise the damage would have been much greater. Monsoonal rains and showery conditions continued right into June; as a result it was not practicable to cultivate some of the land required for the early plantings, and much of the anticipated early plantings had to be deferred. In addition, a considerable proportion of the cane was still immature when harvesting operations commenced. A quantity of grub-damaged cane from neighbouring districts was received at the mill, but grub damage did not occur on this station. Prolific arrowing occurred during May, and some of the backward and late cut crops were seriously affected.

The following are the rainfall records taken at this Experiment Station during the past twenty years:—

Year.	Rainfall in Inches.	Year.	Rainfall in Inches.
1920	94·86	1931	98·82
1921	122·84	1932	76·31
1922	64·90	1933	96·06
1923	53·29	1934	91·44
1924	95·67	1935	59·91
1925	76·98	1936	88·81
1926	59·12	1937	46·33
1927	90·16	1938	55·86
1928	66·33	1939	118·08
1929	102·28	1940 (6 months)	79·47
1930	107·61	Average, 24 years	81·66

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE NORTHERN SUGAR EXPERIMENT STATION, MERINGA, FROM 1ST JULY, 1939, TO 30TH JUNE, 1940.

Month.	Rainfall in Inches.	Number of Wet Days.	Highest Shade Maximum.	Lowest Shade Maximum.	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.	Mean Diurnal Range.	Mean Temperature 9 a.m.	Mean Relative Humidity 9 a.m.
July, 1939	·32	5	85·0	72·4	78·3	67·3	43·0	57·2	21·2	67·9	84
August, 1939	·28	2	90·4	74·0	81·0	64·6	37·4	48·7	32·3	67·3	78
September, 1939	·25	6	92·0	78·8	84·3	64·2	42·4	56·3	28·0	73·2	77
October, 1939	·90	7	93·0	78·7	87·3	71·6	45·6	62·9	24·3	78·3	68
November, 1939	1·63	7	95·6	80·0	90·6	75·6	63·4	69·3	21·2	82·2	69
December, 1939	·25	2	99·2	90·2	94·6	74·5	63·3	70·0	24·7	85·9	59
January, 1940	12·67	14	101·9	78·0	91·6	77·4	68·7	72·8	18·7	82·6	80
February, 1940	18·87	21	96·7	84·2	90·9	77·5	71·1	74·9	16·0	82·9	80
March, 1940	34·37	25	96·1	80·3	86·7	75·5	64·2	72·0	14·7	79·2	87
April, 1940	7·27	17	96·0	80·2	85·2	75·0	58·9	69·1	16·2	78·4	82
May, 1940	1·70	11	87·2	79·1	83·1	69·5	46·8	64·2	18·8	74·6	81
June, 1940	3·59	19	84·0	71·0	78·8	69·0	49·0	62·9	15·8	72·5	84
Totals	82·10	136	..	..	..	..	..	..	..	..	..

NEW EXPERIMENTS INITIATED DURING THE YEAR.

1. Varietal Trial.—5 × 5 Latin square, 4 new seedling canes *v.* S.J.4.

2. Observational Yield Trial.—Sixteen advanced seedlings against a standard variety.

EXPERIMENTS HARVESTED DURING 1939.

1. Observational Yield Trial.—Six advanced seedlings against S.J.4.

OBSERVATIONAL VARIETAL TRIAL.

Varieties.—G.113, 118, 126, 140, 243, H.248, and S.J.4.

Area of Plot.—0·05 acre.

Harvested.—November, 1939.

Age of Crop.—15½ months.

Crop Yields.—(Individual plots of seedling canes.)

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
G.113	27·4	15·0*
G.118	37·4	14·5
G.126	31·4	17·8
G.140	38·0	16·8
G.243	24·4	18·6
H.248	28·6	15·5
S.J.4 (3 plots)	32·6	17·0

* From maturity tests.

DISCUSSION.

Four of these seedlings—G.113, G.126, G.243, and H.248—were selected earlier in the year and planted in a Latin square trial in July, 1940. The results of this trial will be available during the coming crushing season. On tonnage figures it would appear that G.140 and G.118 should have been selected; however, the former showed high susceptibility to leaf scald disease, and was discarded on that account, and G.118 was eliminated on bad habit and very low sugar content during most of the period up to harvest.

The observational trial was ratooned and fertilized, and the first ratoon crop yields will be obtained during the 1940 season.

LAND CLEARING AND NEW PLANTINGS.

A further area of forest land was cleared during the year, in order to provide space for new experiments, chiefly associated with seedling propagation and trials. Some two acres of new land were brought under the plough, while work was done on existing blocks to provide better drainage conditions.

With the promise attending preliminary attempts to transfer cross pollination work to Meringa from Freshwater, more extensive varietal plantings have been made on the station to provide the parental canes for future seasons.

INTRODUCTION OF NEW VARIETIES.

Several new varieties were planted on the Station in 1939. These comprised promising seedlings raised in other

States or by the Colonial Sugar Refining Co. Ltd. in their nurseries, as well as canes from other parts of the world which had just been released from the Brisbane quarantine house. They included:—

C.P.807	31–1389	30 S.N.1031
C.P.29/116	30 R.115	33 S.N.1160
P.O.J.2875	30 G.1250	37 N.G.6
B.726	30 G.1759	Atlas
B.2935	30 S.N.225	Cato
Q.20	30 S.N.362	Comus
Q.25	30 S.N.451	Marcus
Q.29	30 S.N.874	

In all cases, only a few setts of each variety were available, and the crop therefrom will be utilized in planting disease-resistance trials as well as further propagation plots.

Legumes.

The search for valuable leguminous species suitable for these parts was continued. Through the courtesy of the Council for Scientific and Industrial Research and other organisations, a wide range of new species was planted during the year. Those under trial included the following:—*Crotalaria maxillaris, usaramoensis, anagyroides, juncea, Stizolobium atterinum, pachylobium, Dolichos lab-lab, debilis, Phaseolus riccardianus* (strains C.P.I.2778 and 2779), *trinervis, Sesbania paulensis, Glycine javanica, Centrosema pubescens, Calapogonium mucunoides,* and *Pueraria javanica.*

Plantings made in the spring were handicapped by dry weather, but they made good headway following the summer thunderstorms. The summer plantings received good rains at the outset, and made continued growth until late in the season.

Crotalaria usaramoensis gave an excellent germination and seems to possess a better early coverage than other species of the same genus under trial here, whilst it has a good long growing period. Hence it shows more than ordinary promise, and more extensive plantings will be made during the coming year.

Crotalaria anagyroides made good growth and gave a heavy crop of green matter when ploughed under, though it tends to become rather woody as it ages. It likewise appears to be promising.

Phaseolus riccardianus (2 strains) and *P. trinervis* all germinated well, and, despite the relatively dry conditions during their early growth period, they grew vigorously and produced a good volume of green matter before commencing to seed in the autumn.

Pueraria javanica vined and spread well, and produced an abundant crop of green matter. These plants did not flower and commence to set seed until late May, hence this legume should be of special value to those growers who require the protection of a green crop on their lands until well into the winter months.

Further confirmatory plantings of the above legumes will be made during the coming year, and, in addition, plantings will be made of *Stizolobium atterinum, S. pachylobium,* and *Dolichos lab-lab,* which although they produced fair crops, were somewhat affected by the prolonged wet conditions since the plots of these legumes happened to be located on ground somewhat lower than the remainder. The other species will be discarded.

Fodder Crops.

Due to the risk attaching to plantings of maize in cane areas where downy mildew exists, experiments are being conducted at this Station with a view to determining the fodder value of alternative species. A number of grain sorghums were tested for this purpose during the past year, and preliminary results are very encouraging. Varieties Schrock, Coleman, Atlas, American Early Red, Hegari, and Manko were included in the trial; this list also places the varieties approximately in their order of merit. Schrock was definitely outstanding in all three plantings. They produced good heads of grain, and remained free of peach moth caterpillars which are reported to be troublesome in other areas of the State.

Brazilian lucerne (*Stilosanthes guyannensis*) was also introduced and propagated. It produced particularly good yields on some of the poorer forest country, and it should prove a valuable complementary species when sown on some of the poor land grass paddocks.

Cotton Plantings.

In co-operation with the Cotton Branch of the Department of Agriculture, a small trial planting of cotton was made on this Station, to determine the possibilities of the crop in the humid tropics. The varieties included in the trial were—Half and Half, Miller, Okra Acala, Oklahoma Triumph, and New Brooklyn. Planting was done on the 23rd August, 1939.

Owing to the dry spring, germinations were erratic and growth very backward until November. It was not until the end of December that the first bolls opened, and the majority opened during the wet season; there was, therefore, considerable waste of cotton. Insect damage was slight, but stainers become plentiful later in the season.

From these observations it would not appear that cotton-growing will be found a reliable venture in the wet coastal belt, unless the crop can be forced to maturity either before or after the wet season rains. If before, it is likely that earlier planting combined with irrigation would be necessary.

Laboratory Work.

In addition to the customary routine work of sampling new varieties both on the Station and in farm trials, soil analyses for fertilizer and lime requirements were undertaken at this laboratory during the last year, and in this connection a fairly intensive soil sampling programme was carried out in the Mossman area, on those farms where the growers were requiring this service. The following samples were analysed during the year:—

	Samples.
Canes (Station analyses and general maturity tests)	719
Canes, farm trials	118
Canes, farmers' samples	11
Soils	102
Totals	950

Field Day.

The second annual Field Day was held on this station on 8th June, 1940, and although the attendance was not up to the standard that might be expected from an area of this size, still it was 50 per cent. greater than that of the previous year; this in itself was encouraging. However, several who did attend came from distant centres, such as Innisfail and Mossman, and all growers exhibited keenness to keep *au fait* with the progress in this branch of their industry. They were welcomed by the Director and the Deputy Chairman of the Advisory Board, after which followed addresses by the Director and members of his staff on topical agricultural problems. A tour of inspection of the station was then made, and growers generally were interested in viewing the new variety introductions, the locally bred seedlings, the new legumes, and the crops of grain sorghums, which were in excellent head at this particular time.

Crop Summary.	Tons.
Cane sent to the mill	471
Cane used for plants, &c.	13
Total	484
	Acres.
Total area harvested	14·2
Tons cane per acre harvested	34·1

An analysis of the yields shows the following allocation in respect of classes and varieties:—

	Tons.
Plant cane	296
Ratoon cane	188
Total	484
Varieties—	
Badila	104
S.J.4	131
Q.10	87
Miscellaneous (including seedlings)	162
Total	484

CENTRAL SUGAR EXPERIMENT STATION, MACKAY.

MR. D. L. McBRYDE, Chemist in Charge.

METEOROLOGICAL.

The rainfall for the 1939-40 growing season was much in excess of that of the previous year, and the excessive fall during February, 1940 (38·6 inches), had a deleterious influence on the yield for the coming harvest. The soil became seriously waterlogged, and the crop root system suffered severely.

The period from July to November, 1939, was exceedingly dry. December and January rains gave the young crop a good start, and prospects for a heavy cane tonnage were particularly bright until the wet season proper set in. The season was unusual, in that five cyclonic disturbances affected the district. In general, the wind was not very severe, and the crop suffered very little visible damage as a consequence. Flood waters did injure crops growing on low river and creek flats, but these constitute a small proportion of the total area.

The early winter was mild and dry, and crops made little progress during the period. Crop estimates for 1940 are therefore substantially below the record harvest of the previous year.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SUGAR EXPERIMENT STATION AT MACKAY, FROM 1ST JULY, 1939, TO 30TH JUNE, 1940.

Month.	Inches Rainfall.	Wet Days.	Average Rainfall.	Shade Temperatures. Maximum. High.	Maximum. Low.	Maximum. Mean	Minimum. High.	Minimum. Low.	Minimum. Mean.
1939.									
July	0·15	7	1·43 (*a*)	82·5	62·5	71·5	62·5	35·5	49·5
August	0·94	1	0·91 (*a*)	84·5	63·5	75·6	60·0	35·0	44·7
September	0·70	4	1·66 (*a*)	85·5	70·0	76·7	57·0	36·0	46·7
October	1·04	9	1·70 (*a*)	85·5	76·5	81·3	68·5	48·0	59·0
November	1·33	9	3·07 (*a*)	92·0	78·5	85·1	78·0	58·5	66·4
December	3·44	8	7·27 (*a*)	96·0	83·5	85·6	74·5	63·0	69·1
1940.									
January	10·17	14	13·81 (*b*)	95·0	80·0	86·7	77·5	73·5	75·5
February	38·62	25	11·94 (*b*)	94·0	74·0	81·5	78·0	69·5	73·6
March	14·94	21	10·67 (*b*)	89·5	77·5	83·1	76·5	63·5	70·1
April	10·10	19	5·20 (*b*)	83·5	74·5	79·3	70·5	57·0	64·9
May	1·18	10	3·33 (*b*)	83·5	70·5	77·5	65·5	44·0	57·7
June	0·88	17	2·58 (*b*)	77·0	69·0	74·0	66·0	38·5	56·8
Totals	82·86	144	..	..	..	..	..	..	..

N.B.—Rainfalls—(*a*) = average 39 years, (*b*) = average 40 years.

ANNUAL RAINFALL SINCE 1920 AT SUGAR EXPERIMENT STATION, MACKAY.

Year.	Rainfall in Inches.	Year.	Rainfall in Inches.
1920	57·27	1931	30·01
1921	95·89	1932	48·48
1922	34·47	1933	71·94
1923	25·23	1934	37·57
1924	53·37	1935	45·15
1925	54·80	1936	97·37
1926	34·69	1937	56·60
1927	83·87	1938	52·18
1928	72·28	1939	56·14
1929	64·03	1940 (6 months)	75·89
1930	55·81	Average, 20 years	56·36

EXPERIMENTS HARVESTED DURING 1939 SEASON.

1. Varietal Trial—Mackay Seedlings *v.* Q.813, Latin Square, Plant Cane.
2. Observational Variety Trial—Mackay Seedlings *v.* Q.813, Single Plot, Plant Cane.
3. Downy Mildew Resistance Trial.

EXPERIMENTS INITIATED DURING 1939.

1. Varietal Trial—Mackay Seedlings *v.* Q813, Latin Square, Plant Cane.
2. Varietal Trial—Jason, Comus, Q.20, Q.28 *v.* Q.813, Latin Square, Plant Cane.
3. Observational Variety Trial—Seedlings *v.* Q.813, Plant Cane.
4. Fertility Trial—Factorial Trial (3 x 3 x 3), Plant Cane.

VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

E.45	**Q.813**	**Comus**	**Q.28**	**E.4**
28.4	**25.2**	**37.4**	**42.3**	**36.5**
E.4	**Q.28**	**E.45**	**Q.813**	**Comus**
35.4	**38.5**	**30.0**	**30.6**	**34.5**
Q.813	**Comus**	**Q.28**	**E.4**	**E.45**
32.0	**33.3**	**41.0**	**37.2**	**25.5**
Comus	**E.4**	**Q.813**	**E.45**	**Q.28**
35.6	**35.4**	**31.1**	**28.2**	**41.0**
Q.28	**E.45**	**E.4**	**Comus**	**Q.813**
44.4	**32.2**	**39.2**	**39.2**	**31.8**

Block.—B2.
Harvested.—October, 1939.
Age of Crop.—14 months.
Experimental Plan.—5 × 5 Latin Square.
Plots.—1/18 acre.

Fertilizer Applied.—All plots received 4 cwt. Sugar Bureau No. 1 Planting Mixture in the drill at the time of planting, and 3 cwt. of sulphate of ammonia as two equal top dressings in November, 1938, and January, 1939.

SUMMARY OF YIELDS, PLANT CROP.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
E.4	36·7	15·7
E.45	28·8	16·3
Q.28	41·4	14·3
Comus	36·0	16·2
Q.813	30·1	16·2

DISCUSSION.

Varieties E.4, E.45, and Q.28 are three seedlings which were raised at the Mackay Station and which survived final selection. Q.28 is a particularly vigorous cane which may have a future on poor lands of the Mackay district, and it will be placed in farm yield trials during the coming spring. Comus, a seedling propagated by the C.S.R. Coy., has also shown promise in this trial. Its chief drawback is its decided susceptibility to mosaic disease.

OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

PLAN AND YIELDS.

F.57	**F.21**	**Q.813**	**G.22**
36.0	**33.8**	**33.5**	**42.5**
G.39	**Q.813**	**G.18**	**G.19**
39.8	**35.3**	**47.0**	**39.8**
F.40	**G.5**	**G.52**	**Q.813**
35.3	**38.3**	**33.0**	**31.0**
Q.813	**G.58**	**F.58**	**G.17**
31.5	**49.8**	**34.5**	**48.3**
G.20	**G.8**	**Q.813**	**F.31**
44.0	**40.5**	**34.0**	**33.8**

Block.—B2.
Harvested.—October, 1939.
Age of Crop.—14 months.
Experimental Plan.—Single plots with contacting Q.813 plots.
Plots.—1/20 acre.

Fertilizer Applied.—4 cwt. Sugar Bureau No. 1 Planting Mixture in the drill, and 3 cwt. of sulphate of ammonia in two top dressings, in November, 1938, and January, 1939.

SUMMARY OF YIELDS—PLANT CROP.

Variety.	Cane per Acre.	C.C.S. in Cane.		
		4-7-39.	9-8-39.	12-9-39.
	Tons.	Per cent.	Per cent.	Per cent.
G.5	38·3	9·9	..	..
G.8	40·5	7·5	10·8	..
G.17	48·3	8·2	12·0	13·9
G.18	47·0	7·0	..	..
G.19	39·8	8·6	12·9	..
G.20	44·0	9·5	..	..
G.22	42·5	8·3	12·6	13·8
G.39	39·8	11·6	13·9	15·9
G.58	49·8	12·2	14·7	17·2
F.21	33·8	8·3	12·0	..
F.31	33·8	10·2	..	..
F.40	35·3	11·0	12·4	..
F.57	36·0	7·5	..	..
F.58	34·5	8·8	11·8	..
Q.813 (average) ..	33·8	11·5	16·1	15·4

DISCUSSION.

These canes were also placed in the downy mildew resistance trial and all except G.17, G.22, G.39, and G.58 were discarded on account of their evident susceptibility to that disease. The four named varieties were carried forward in a Latin Square Varietal trial, with Q.813 as the standard cane.

DOWNY MILDEW RESISTANCE TRIAL.

A trial of G, H and I series selected seedlings with well-known standard canes was carried out on an isolated plot. Full details of results have been reported in a special report.

ROTATIONAL EXPERIMENTAL BLOCK, DIVISION C.

Section 1.—This section was sown with rhodes grass, runners of para grass (*Panicum muticum*) were planted and, after several months, brought into the grazing area once again.

Section 4.—A green crop was grown, after breaking up this section, and ploughed in. The area was planted in September, 1939, with variety Q.20. The lateness of date of planting, due to the presence of a large population of wireworms in the soil, militated against crop growth and the cane was very small when the wet season set in. As a consequence, the yield from this crop will be much lower than from any of the previous sections.

Section 5.—This section was broken up in December, 1939, and Poona pea sown. A good crop resulted but it was not ploughed in until the end of May, owing to wetness. The block has been carefully graded and is awaiting planting which, owing to heavy wireworm population, will not be until October.

Grazing Sections (6, 7, 8 and 1).—Sheep have run on these sections throughout the period except for two months during which they were kept on No. 1 section only in order to keep down a heavy overgrowth of grasses. Feed has been plentiful throughout, but during the spring of 1939, which was dry, a ration of molasses and meal was fed to the animals. The ration consisted of 1 lb. molasses (slightly thinned with water), and 1 oz. of peanut or cotton seed meal mixed with 1 lb. of chop chop per head per day.

The sheep were shorn in October and again yielded 5 lb. per fleece. Drenching for stomach worms was carried out on two occasions during the year. Blowflies gave very little trouble but two ewes were lightly struck.

There were serious losses when crows attacked the newly marked lambs. Marking and tail-docking was done during the very dry weather, and it is thought that natural scarcity of food, combined with the smell of blood, caused the crows to attack the young lambs. Unfortunately, four ewes were among the five lambs so destroyed.

Lambing was again disappointingly low and only eleven lambs were dropped. Five lambs (male) were sold at about 4½ months, dressing about 35 lb. and realising 17s. 6d. per head.

Sections 2 and 3 were harvested during 1939, the former as a ratoon crop and the latter as plant cane.

Section 3 will be ploughed out during 1940, all trash being turned under and, after a green crop, will be sown with grass and returned to the grazing area.

SUMMARY OF CROP YIELDS.

Section.	Variety.	Harvested.	Nature of Crop.	Cane per Acre.	C.C.S. in Cane.
				Tons.	Per cent.
C.1	C.83	1937	Plant ..	26·2	15·7
		1938	1st Ratoon	29·8	16·8
C.2	Mixed	1938	Plant ..	31·8	15·3
		1939	1st Ratoon	26·4	14·35
C.3	Q.20	1939	Plant ..	32·9	14·5

SHEEP GRAZING EXPERIMENT.

There can no longer be any doubt about the suitability of the coastal lands for sheep grazing and, although it must be admitted that lambing throughout the whole five-year period during which we have run the flock on the Rotational Block has been very light and disappointing, we can fairly claim that losses through all natural causes have been very small, and the lambs thrive and fatten satisfactorily.

The para grass is holding on well although it has been thinned out considerably by constant grazing since the experiment was initiated, and the sensitive weed (*Mimosa pudica*) has increased very considerably. Except during dry spring weather, when all vegetation is dry and hard, these species offer excellent feed for the sheep.

HORSES.

The station horses have been fed on the mixed ration throughout and, except in instances where broken teeth have put two horses off their feed until corrected by the veterinary surgeon, the animals have kept good condition. It is found, however, that peanut meal is not so palatable as either linseed or cotton seed meals.

The ration per feed, which has been published in previous reports, is as follows:—

18-20 lb. chop chop (cane or grass);
2 lb. molasses;
12 oz. peanut or cotton seed meal, or 1 lb. linseed meal.

Three feeds daily are given while working except on Saturday, when the animals are fed twice. On Sundays one feed only is given. Care is taken to dilute the molasses freshly so as to avoid fermentation; the dry feed is dampened with the dilute molasses (50-50) in the boxes when the horses are about to be let in to feed.

EXPERIMENTAL LEGUMES.

A number of new legumes were tried out on the station last year. They were carefully tended and irrigated to ensure establishment. Certain of these showed promise of being good green manures, particularly as they came through an exceptionally wet season without being damaged. The more promising varieties are *Dolichos debilis*, *Dolichos lab-lab*, *Phaseolus riccardianus*, and *Phaseolus trinervis*.

The seed of all varieties was saved and a more extensive trial will be carried out during the coming year.

LABORATORY WORK.

The following cane analyses were made during the year:—

Station samples	151
Farmers' samples (mostly maturity tests) ..	103
Mackay Show exhibits	59
Farm trial samples	107
Total analyses	420

SEEDLING EQUIPMENT.

The seedling table area was increased by casting 3-feet wide slabs between existing tables, thus giving sufficient space and comfortable capacity to handle over 7,000 pots at once.

IRRIGATION PLANT.

The irrigation main was extended, by laying 4-inch wrought iron piping to take in A.3 seedling block. This main will also bring B.3 within reach of our spray system if ever it becomes necessary to irrigate this block.

1939 CROP SUMMARY.

Block.	Variety.	Class.	Area.	Cane Tonnage.	Cane Per Acre.	C.C.S.
			Acres.		Tons.	Per cent.
A.2	Seedlings	Plant	1·2	38·9	32·4	15·6
A.3	Seedlings	..	1·9	50·3	26·5	14·5
B.2	Varieties	Plant	2·6	88·7	34·1	15·3
C.2	Varieties	1st Ratoons	1·8	47·5	26·4	14·4
C.3	Q.20	Plant	1·8	59·1	32·9	14·5
D.1	M.1900 Seedling	Plant	5·1	127·4	25·0	15·4
	P.O.J.2725					
D.2	M.1900 Seedling	1st Ratoons	7·4	192·7	26·1	15·3
	Q.20					
Totals and Averages			21·8	604·6	27·7	15·1

Of the above crop yield, 565 tons were sent to the mill and 39·6 were sold and used as plants.

SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG.

Mr. N. J. King, Chemist in Charge.

METEOROLOGICAL.

The winter of 1939, though not severe, was of long duration and cold weather continued to the end of August. A very dry September followed on an almost rainless month—the August rainfall being obtained in the first three days of the month. Some fair precipitations during October and November gave a start to the young ratoons and December was a month of good rainfall well distributed. During January, February, and March growth was well sustained by sufficient soil moisture, but from the end of March a severe drought continued until the end of June. On the whole the year was not a good one for crop production.

1939 Crop.

The 1939 crops in the Bundaberg area were well in excess of the peak requirements of the mills. A record harvest was obtained owing to the large export quota, but considerable tonnages were still available for standover purposes. The value of the standover crop to this district becomes more evident year by year, the old-time irregularity of production with one year cropping being now ironed out into a regular high yield over the entire district. The total rainfall for the year 1938-1939 was 41·01 inches, and the distribution left much to be desired; for seven weeks during the important months of December and January no effective rain fell. The fact that high production still persisted says much for the abovementioned value of the standover practice, the varieties being grown, and the recuperative powers of the crops.

Rainfall Records.

The following are the rainfall records taken at this station since the Experiment Station began operations in 1914. To conform with the year covered by the report the rainfalls are given for the growing season beginning in July and ending in June:—

1914–1915	31·99	1927–1928	74·69
1915–1916	28·54	1928–1929	31·16
1916–1917	58·08	1929–1930	43·16
1917–1918	49·85	1930–1931	47·19
1918–1919	24·24	1931–1932	22·88
1919–1920	28·20	1932–1933	36·81
1920–1921	45·16	1933–1934	71·45
1921–1922	44·97	1934–1935	40·01
1922–1923	37·14	1935–1936	44·24
1923–1924	34·16	1936–1937	31·65
1924–1925	50·96	1937–1938	44·40
1925–1926	37·62	1938–1939	41·01
1926–1927	68·18	1939–1940	41·69

Month.	Rainfall.	No. Wet Days.	Highest Shade Max.	Lowest Shade Max.	Mean Shade Max.	Highest Shade Min.	Lowest Shade Min.	Mean Shade Min.	Mean Diurnal Range.	Mean Temperature 8 a.m.	Mean Relative Humidity 8 a.m.
1939.											
July	1·39	4	75	60	68	51	40	46·5	21·5	50·0	81·3
August	3·56	2	79	58	70·8	58	36	42·7	28·1	56·1	79·7
September	0·05	1	80	68	74·1	61	36	45·6	28·5	62·2	70·3
October	3·28	10	82	72	76·8	62	46	56·1	20·7	69·5	71·0
November	3·54	7	90	76	82·2	73	54	63·6	18·6	76·0	72·5
December	9·32	10	89	80	83·5	74	59	67·0	16·1	78·0	74·0
1940.											
January	2·12	9	94	77	85·8	79	63	71·5	14·3	76·3	75·0
February	9·97	11	98	72	79·8	77	64	71·3	8·5	78·6	82·5
March	5·87	13	89	75	81·9	76	60	66·5	15·4	73·5	86·9
April	1·91	11	83	72	79·1	70	46	60·2	18·9	69·2	86·2
May	0·45	4	80	71	76·2	60	39	53·3	22·9	62·6	87·0
June	0·23	3	78	64	73·3	57	36	51·5	21·8	59·9	88·0

VARIETAL TRIAL (PLANT CROP).

Plan and Yields.

E.18	Comus	E.14	C.12	Co.290
25.5	22.6	30.2	28.4	27.9
E.14	Co.290	C.12	E.18	Comus
27.9	29.7	28.4	30.2	25.0
C.12	E.14	Co.290	Comus	E.18
26.3	25.5	30.2	22.4	27.9
Comus	C.12	E.18	Co.290	E.14
21.9	25.0	27.9	28.6	29.4
Co.290	E.18	Comus	E.14	C.12
29.2	26.3	23.2	28.6	28.9

Block.—A2.

Harvested.—October, 1939.

Age of Crop.—13 months.

Plan.—Latin square (5 × 5).

Plots.—0·048 acre (with guard rows of P.O.J.234 and Co.281).

TREATMENT.

This block was planted in September, 1938, under conditions not usually met with on an Experiment Station. Expediency compelled the ploughing out of an old experiment and the immediate replanting of the land with the above Latin square. Land preparation was, therefore, not quite satisfactory, and this combined with very dry planting conditions resulted in a bad strike. It was heavily supplied. The block was fertilized at planting with No. 3 Sugar Bureau planting mixture (4 cwt. per acre) in the drill, and sulphate of ammonia was applied later as top dressing at the rate of 275 lb. per acre.

GROWTH NOTES.

The variety Comus very soon established a good lead, followed by E.14, E.18, C.12, and Co.290 in that order. Comus kept the lead until January, when the effects of the dry spell caused it to fall back. In later stages there appeared nothing to choose between varieties.

Crop Yields.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
Comus	23·0	16·1
C.12	27·4	14·9
E.18.	27·6	16·9
E.14	28·3	17·2
Co.290	29·1	15·5

DISCUSSION.

In view of the early growth conditions, the resulting yields were surprisingly good. The standard cane (Co.290) outyielded the other varieties in cane tonnage, though three of these gave a superior sugar content. E.18, in another planting elsewhere in the district, proved to be very susceptible to fox damage; this would detract considerably from its value as a commercial variety.

OBSERVATIONAL VARIETAL TRIAL (Plant Crop).

Plan and Yields.

F.22	Co.290	F.21
25.9	23.9	26.2
F.25	F.23	F.10
23.6	26.0	24.5
Co.290	F.19	Co.290
24.6	25.8	28.4
F.20	F.28	F.26
28.1	21.2	24.5

Block.—A3.

Harvested.—August, 1939.

Age of Crop.—12 months.

Plots.—0·0783 acre.

TREATMENT AND GROWTH NOTES.

This observational yield trial was planted in August, 1938, on land which had a 12 months' fallow under peas and partly under Gambia pea. The block is not a very good one owing to ironstone gravel near the surface. The crop was backward from the start, and even at time of harvesting did not appear to be carrying the crop which the weights indicate. It was fertilized with Sugar Bureau Planting Mixture No. 3 at the rate of 3 cwt. per acre.

CROP YIELDS.

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
F.28	21·2	13·4
F.25	23·6	12·0
F.26	24·5	10·4
F.10	24·5	13·7
Co.290 (3 plots)	25·6	11·45
F.19	25·8	11·8
F.22	25·9	11·7
F.23	26·0	12·3
F.21	26·2	12·8
F.20	28·1	11·7

DISCUSSION.

This preliminary trial embracing advanced seedlings was set out for the purpose of enabling the more promising to be selected for inclusion in a Latin square yield trial. As individual plots only were possible, the potential value of the varieties must be assessed on other qualities as well as yield index. Several apparently outyielded the standard (Co.290). In all cases sugar values were rather low; most varieties were quite immature when harvested, but this was unavoidable as the plots had to provide planting material for a further trial.

FACTORIAL FERTILITY TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

1N 1P 0K 24.8	2N 1P 1K 30.4	0N 2P 0K 29.5
2N 2P 2K 28.4	0N 0P 1K 21.8	1N 0P 2K 29.7
0N 1P 2K 28.4	1N 2P 1K 26.4	2N 0P 0K 26.8
2N 0P 1K 24.6	0N 1P 0K 26.7	1N 2P 2K 25.0
0N 0P 2K 24.2	1N 0P 0K 22.0	2N 2P 0K 23.5
1N 1P 1K 22.8	2N 1P 2K 26.4	0N 2P 1K 26.2
0N 1P 1K 25.9	1N 2P 0K 26.8	2N 2P 1K 28.0
2N 1P 0K 29.8	0N 0P 0K 27.6	1N 0P 1K 32.4
1N 1P 2K 28.9	2N 0P 2K 30.4	0N 2P 2K 29.5

Block.—B1.
Harvested.—October, 1939.
Age of Crop.—13 months.
Variety.—Co.290.
Plan.—3 × 3 × 3 factorial trial.
Plots.—0·067 acre.

TREATMENT AND GROWTH NOTES.

Subsequent to harvesting the plant crop the block was ratooned, as usual, with the single-tyne subsoiler—three times per interspace. Fertilizer was then applied at the following rates:—

1N = 120 lb. sulphate of ammonia per acre.
2N = 240 lb. sulphate of ammonia per acre.
1P = 400 lb. superphosphate per acre.
2P = 800 lb. superphosphate per acre.
1K = 180 lb. muriate of potash per acre.
2K = 360 lb. muriate of potash per acre.

All the phosphate and potash was applied at ratooning, while the sulphate of ammonia was applied in two equal dressings when the crop was further advanced, and weather conditions suitable. The crop ratooned well, but was badly wilted and wind-burnt during December and January. It revived with late January rains, and proceeded to make good growth in the later months.

SUMMARY OF YIELDS—PLANT AND FIRST RATOON CROPS.

Treatment.	Plant Crop.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
0N	35·1	12·7	26·6	14·9
1N	34·3	12·4	26·5	15·0
2N	35·3	12·5	27·6	14·8
0P	34·1	12·5	26·6	14·7
1P	35·5	12·5	27·1	15·0
2P	35·0	12·5	27·0	15·1
0K	34·5	12·8	26·4	15·2
1K	35·4	12·5	26·5	14·9
2K	34·8	12·3	27·9	14·7

DISCUSSION.

As was the case with the plant crop, the first ratoon yields exhibited no benefits from any of the plant-food treatments. The influence of treatment on the C.C.S. values was, however, marked. With progressive potash applications, the sugar content of the crop was lowered, suggesting that the crop was over-mature when harvested. The heavy phosphate applications showed the opposite effect; where superphosphate was applied at the rate of 800 lb. per acre, the C.C.S. of the crop was the best. It is well recognised that one influence of phosphate on cane growth is to delay maturity.

This trial was again ratooned, and it is anticipated that the second ratoon yields will be very interesting.

VARIETAL TRIAL—Co.290 *v.* P.O.J.213 (First Ratoon Crop).

PLAN AND YIELDS.

P.O.J. 213 33.8	Co.290 27.5	P.O.J.213 32.4
Co.290 28.0	P.O.J.213 27.4	Co.290 26.6
Co.290 28.6	P.O.J.213 27.4	P.O.J.213 27.9
P.O.J.213 30.3	Co.290 26.2	Co.290 27.0
Co.290 28.2	P.O.J.213 30.9	Co.290 31.0
P.O.J.213 31.6	Co.290 29.4	P.O.J.213 31.6

Block.—B2.
Harvested.—October, 1939.
Age of Crop.—14 months.
Plots.—0·099 acre.
Experimental Plan.—Nine randomised blocks.

TREATMENT.

This crop followed the harvesting of the plant crop in August, 1938. It was ratooned with the single-tyne subsoiler, and then fertilized with Sugar Bureau No. 3 ratooning mixture (4 cwt. per acre), followed later with 275 lb. of sulphate of ammonia per acre. During the dry summer months the P.O.J.213 established its lead, the Co.290 being severely wind-burnt and almost dead. Later in the year the lead of the P.O.J.213 did not seem so apparent, but it is evident in the yields.

SUMMARY OF YIELDS—PLANT AND FIRST RATOON CROPS.

Variety.	Plant Crop.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
Co.290	34·9	12·5	28·6	15·5
P.O.J.213	33·0	13·4	30·4	15·3

DISCUSSION.

The comparative yielding power of these two canes appears to be something which must be established for the local conditions; Co.290 has in previous trials established its superiority over P.O.J.213 even on the same soil type. It would appear that in a dry year P.O.J.213 might be the better cane, whereas in an average to good year, Co.290 is the better yielder.

VARIETAL TRIAL (Second Ratoon Crop).

PLAN AND YIELDS.

P.O.J.2878 27.1	Co.290 27.6	P.O.J.234 25.6	P.O.J.2940 31.1	P.O.J.2883 30.2
P.O.J.2875 36.3	P.O.J.2883 29.1	P.O.J.2875 30.2	P.O.J.2878 31.7	P.O.J.234 26.5
P.O.J.2725 26.2	P.O.J.2940 29.4	P.O.J.2883 30.0	Co.290 29.7	P.O.J.2878 35.4
P.O.J.234 23.3	P.O.J.2875 33.4	Co.290 27.4	P.O.J.2725 28.5	P.O.J.2875 31.4
P.O.J.2883 31.4	P.O.J.2725 28.2	P.O.J.2940 30.0	P.O.J.234 27.1	Co.290 31.1
P.O.J.2940 32.2	P.O.J.234 25.4	P.O.J.2878 26.5	P.O.J.2875 30.2	P.O.J.2725 27.4
Co.290 30.2	P.O.J.2878 30.8	P.O.J.2725 26.2	P.O.J.2883 26.2	P.O.J.2940 30.5

Block.—B3.
Harvested.—November, 1939.
Age of Cane.—13 months.
System of Replication.—Five randomised blocks.
Plots.—0·0434 acre (guard rows of P.O.J.234).

TREATMENT.

This block gave a very satisfactory crop considering the age of the stools and the type of year experienced. After harvesting the first ratoon crop the block was ratooned as usual with the single-tyne subsoiler—three times per interspace—and then fertilized with Sugar Bureau No. 3 ratooning mixture at the rate of 4 cwt. per acre. This was followed at a suitable interval with 275 lb. of sulphate of ammonia per acre.

GROWTH NOTES.

From the start the crop was rather backward, the very dry summer militating against good growth in these varieties. With the exception of P.O.J.2883, Co.290 and P.O.J.2725 the varieties are of upright habit, and in a dry year a considerable time elapses before the interspaces are covered in. With a variety like P.O.J.2940 the coverage is never satisfactory. This bad feature only aggravates the conditions brought about by lack of moisture, and although this variety performs very well insofar as sugar content is concerned, its agricultural features eliminate it as a major commercial variety even if its pathological features did not.

SUMMARY OF YIELDS—PLANT AND RATOON CROPS.

Variety.	Plant Crop.		First Ratoon Crop.		Second Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
P.O.J.2875 ..	22·1	15·6	37·4	14·9	32·3	16·4
P.O.J. 2940 ..	20·0	16·8	36·9	16·0	30·6	17·5
P.O.J.2883 ..	21·6	16·3	35·5	15·1	29·4	17·0
Co.290	15·0	16·3	34·2	14·7	29·2	15·8
P.O.J.2878 ..	20·0	15·3	33·5	14·7	30·3	17·2
P.O.J.2725 ..	18·8	17·6	32·6	15·7	27·3	16·8
P.O.J.234 ..	16·1	16·2	24·9	15·3	21·6	16·7

DISCUSSION.

The variety P.O.J.2875 has produced the heaviest cane tonnage in each year,, but its inferior sugar content is also evident. The adverse characteristics of P.O.J.2940 have already been discussed. P.O.J.2883 has performed uniformly well, and this variety would be added to the list of approved varieties, if the disease position were improved.

ROTATIONAL TRIAL.—(Plant Crop).

PLAN AND YIELDS.

0K 33.6	2K 32.8			0K 35.6	1K 36.8
2K 37.3	1K 33.2			2K 34.5	0K 37.2
1K 40.0	0K 44.2			1K 35.5	2K 36.9
Sect. 3	2	1	1	2	3

Block.—B4.
Harvested.—July-August, 1939.
Age of Crop.—16–17 months.
Variety.—P.O.J.2878.
Plots.—0·236 acre, with guard rows of P.O.J. 234.

TREATMENTS.

This is a long-range trial, designed to provide information regarding the value of fallowing with cane production. The red volcanic lands of the Woongarra are subject to the development of "soil sickness" if cropped by the same variety over a long period of years. This was notably true when Q.813 was the standard variety.

The plan consists of dividing a large block into six strips, which are grouped in pairs for each of the three treatments:—(1) 18 months fallow with legumes, followed by plant and one ratoon crop of cane; (2) and (3) 6 months fallow with legumes, followed by plant, first and second ratoon crops of cane; when the area is subsequently replanted one of these sections will have P.O.J.2878 once again, but a fresh variety will be planted in the other.

It will be noted that the strips are again subdivided, so that the experiment serves also as a long range potash trial. The annual treatments are—

0K = no potash
1K = 150 lb. muriate of potash
2K = 300 lb. muriate of potash
} in addition to uniform phosphate and nitrogen.

GROWTH NOTES.

The area was uniformly planted to Poona pea late in 1937. The crop was ploughed under early in 1938, and Sections (2) and (3) were planted to cane. The central portion of the block later produced a winter crop of blue lupin, and a further crop of Poona pea in the early summer, prior to early planting in 1939, for 1940 harvest.

The cane crop on Sections (2) and (3) made uniformly good growth from the start, and even the dry weather of December and January did not greatly distress the cane. As it was harvested early in the crushing season, the C.C.S. values were low, due to crop immaturity.

CROP YIELDS.

Treatment.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
No potash	37·7	12·4
150 lb. KCl	36·4	12·3
300 lb. KCl	35·4	11·8

DISCUSSION.

The apparently depressed yields due to potash treatment may be attributed largely to soil fertility variations within the block. This land has received consistent applications of potash fertilizer, and probably some years will elapse before potash deficiency becomes evident.

OBSERVATIONAL VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

E.14 39.8	Co.290 35.7	E.12 37.4	E.15 49.2
Co.419 *31.5	E.16 36.5	E.18 39.2	Co.290 38.0
Co.290 30.5	E.10 29.2	E.6 36.2	Comus 31.1
Jason 25.4	E.3 22.8	Co.290 28.8	E.1 17.6

* Cut back in January, 1939.

Block.—D1.
Varieties.—Seedling canes *v.* Co.290.
Harvested.—November, 1939.
Age of Crop.—13 months.
Plots.—0·0483 acre.

TREATMENT.

Subsequent to harvesting the plant crop, the block was ratooned with a single-tyne subsoiler—three times per interspace—and was then fertilized with Sugar Bureau No. 3 ratooning mixture at the rate of 4 cwt. per acre. Sulphate of ammonia was applied later as a top dressing, 275 lb. per acre being used.

GROWTH NOTES.

October and November rains gave the crop an excellent start in the ratoons, but this good beginning was followed by a very dry December and January. Practically no rain in December caused irreparable damage to all crops in the district. Late January rains saved the situation in some degree, but February rains were also much below normal. Good March and April falls made the crop for the season. The block is not altogether suitable for experimental purposes owing to a well-defined moisture gradient; it is hoped that conclusions drawn are made less erroneous by comparing each seedling with the Co.290 plot immediately adjoining.

SUMMARY OF CROP YIELDS, PLANT AND FIRST RATOON CROPS.

Variety.	Plant Crop.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
Co.290	41·8	14·0	33·3	15·4
†Co.419	..	..	31·5	14·3
Comus	37·8	15·6	31·1	17·1
Jason	31·3	13·8	25·4	15·1
E.1	27·2	14·5	17·6	15·8
E.3	29·2	14·8	22·8	17·0
E.6	36·0	15·4	36·2	16·4
E.10	34·4	13·3	29·2	15·6
E.12	47·1	15·7	37·4	16·7
E.14	44·5	15·1	39·8	15·9
E.15	52·8	13·5	49·2	17·1
E.16	35·5	14·1	36·5	17·1
E.18	36·2	14·9	39·2	17·9

† Cut back in January, 1939.

DISCUSSION.

Of the above, E.12 (now Q.42) and E.14 (now Q.43) have been advanced to farm observation trials in which they will be planted in the Bundaberg district this spring. The variety Jason has been tested in a number of farm observation plots in all Southern districts; it is a hardy disease-resistant cane but its lower sugar content, extreme hairiness and greater tendency to arrow cause it to compare rather unfavourably with P.O.J.2878. It was thought that the New South Wales seedling Comus might have some value on account of its frost resistance, but susceptibility to mosaic disease and delayed maturity under Bundaberg conditions have ruled this possibility out. Co.419, E.10, E.16 and E.18 have exhibited susceptibility to Fiji and/or downy mildew diseases and have had to be discarded on that account. As will be seen from the plan of this trial the seedling E.15 enjoyed full benefit of the moisture and fertility gradient and its yield was markedly inflated thereby.

Tests so far carried out indicate that E.12 (Q.42) is satisfactorily resistant to gumming, Fiji and, highly so, to downy mildew, but will probably be too susceptible to mosaic to be grown on river flats; it is fairly vigorous with good sugar content. E.14 (Q.43) is also resistant to the three major diseases but on present information is not quite as promising as E.12.

VARIETAL TRIAL (First Ratoon Crop).

PLAN AND YIELDS.

Q.23 23.1	Co.290 30.7	Q.22 34.2	Q.24 31.3	Q.25 33.7
Q.25 28.9	Q.24 26.2	Q.23 22.5	Co.290 34.4	Q.22 31.6
Q.22 31.9	Q.25 40.5	Co.290 28.5	Q.23 18.9	Q.24 23.5
Q.24 21.8	Q.23 21.0	Q.25 32.0	Q.22 30.8	Co.290 30.0
Co.290 28.3	Q.22 30.4	Q.24 21.9	Q.25 28.8	Q.23 20.0

Block.—D2.
Harvested.—November, 1939.
Age of Crop.—12 months.
Experimental Plan.—5 × 5 Latin square.
Plots.—0.065 acre (9 rows per plot with guard rows of P.O.J.234).

TREATMENT AND GROWTH NOTES.

After harvesting the plant crop the block was ratooned with the subsoiler—three times per interspace—and then fertilized alongside the stool with Sugar Bureau No. 3 ratooning mixture 4 cwt per acre. This was followed when the cane was advanced by a top dressing of sulphate of ammonia at the rate of 275 lb. per acre.

The block ratooned well, and was kept clean until the cane had covered in. Variety Q.23 ratooned more quickly than the others—as was previously recorded—but it did not retain the early lead. This block, cut in November, suffered badly from the prolonged dry spell of December and January. It made most of its growth in March and April when frequent falls kept the cane growing vigorously and without check. Although the crop was harvested this year at barely 12 months the sugar content was very satisfactory.

SUMMARY OF YIELDS—PLANT AND FIRST RATOON CROP.

Variety.	Plant Crop.		First Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
Co. 290	39·8	14·3	30·4	15·2
Q. 22	35·9	14·6	31·8	15·2
Q. 23	27·1	15·6	21·1	16·2
Q. 24	34·1	14·9	24·9	15·3
Q. 25	45·4	16·0	32·8	17·2

DISCUSSION.

The outstanding variety in this trial was Q.25. Indeed, it has shown such promise that steps were taken to establish a large number of farm propagation plots of the variety during the spring of 1939, and some 800 tons of cane will be available for use as plants in the Bundaberg area during the coming planting season.

In disease-resistance trials the cane was found to possess high resistance to gumming and downy mildew disease, but is somewhat susceptible to Fiji disease. It must, therefore, be restricted in its plantings until the disease position in Southern Queensland is improved; but it is anticipated that it may be safe to plant it in the Maryborough and Nambour districts in two or three years.

POTASH TRIAL (Second Ratoon Crop).

PLAN AND YIELDS.

NPK 26.9	NP 28.2	NP2K 28.4	NP 25.9	NP2K 23.7	NPK 24.1
NP 27.3	NP2K 23.5	NPK 25.8	NP2K 21.4	NPK 23.9	NP 24.8
NP2K 22.9	NPK 24.2	NP 26.1	NPK 23.7	NP 24.6	NP2K 28.6

Block.—E2.
Variety.—Co. 290.
Harvested.—September, 1939.
Age of Crop.—12 months.
System of Replication.—2—3 × 3 Latin squares.
Area of Plots.—0·066 acre.

TREATMENT AND GROWTH NOTES.

This block was ratooned as soon as harvested by using the subsoiler three times per interspace. Fertilizer was then applied according to the treatments:—

N = 225 lb. sulphate of ammonia per acre.
P = 225 lb. superphosphate per acre.
1K = 150 lb. muriate of potash per acre.
2K = 300 lb. muriate of potash per acre.

All potash and super. was applied at ratooning time while the sulphate of ammonia was applied as a top dressing in late November. This block also suffered from the growth check in December and January, the Co.290 variety showing its usual susceptibility to wind burn and general leaf damage during a very dry, hot spell. The recuperative powers of the variety are, however, well known, and the block made a rapid recovery in February-March.

SUMMARY OF YIELDS—PLANT, FIRST AND SECOND RATOON CROPS.

Treatment.	Plant Crop.		First Ratoon Crop.		Second Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
NP	13·1	15·1	31·9	13·6	24·5	12·0
NP1K	12·9	15·0	32·0	13·2	24·8	12·6
NP2K	13·3	14·9	32·0	13·2	26·4	12·7

DISCUSSION.

Although the plant and first ratoon crops showed no gain in yields for potash applications, there is evidence in the second ratoon results that potash deficiencies are beginning to show themselves. Unfortunately, this block must be used in future for seedling purposes, and it has been necessary to transfer the trial to a new site.

One feature of special interest with the latest crop is the influence of potash on crop maturity. Due to late growth, the cane was not fully mature when harvested; but it will be noted that the C.C.S. of the potash plots is substantially above that for the NP treatment. This feature has been noted on previous occasions especially with potash-deficient lands. The use of this plant-food on such farms thus increases the cane yield and also induces early maturity.

PERMANENT TRASH TRIAL (Second Ratoon Crop).

PLAN AND YIELDS.

No Trash.	Trash.	Trash.	No Trash.
30.2	31.1	30.7	27.7

Block.—E3b.
Variety.—P.O.J.2725.
Harvested.—September, 1939.
Age of Crop.—12 months.
Plots.—0·382 acre.

TREATMENT AND GROWTH NOTES.

The second ratoons of the permanent trash trial were ratooned with the subsoiler in every interspace of the "no trash" plots, and in alternate interspaces of the "trash" plots, since the trash was conserved in alternate interspaces. Fertilizer was applied to one side of every row at the rate of 4 cwt. of Sugar Bureau No. 3 ratooning mixture per acre, and this was later followed by a top dressing of 275 lb. of sulphate of ammonia per acre. A certain number of gaps appeared in the trash plots due to death of stools. The rows run in an east-west direction, and the tendency is for the prevailing south-east wind to blow the trash from the interspaces into the rows of cane. This inhibits to some extent the free ratooning of the variety. This can be overcome by frequent attention to the trash during the early stages, but the extra expense must then be a feature of the economy of the method. Trash conservation may result—under certain conditions—in a crop increase, but if the increase is offset by greater labour charges then the method fails in its objective. During the growth of the crop the trash plots were always fresher and greener than the bare plots, exhibiting the value of the trash cover in conserving soil moisture.

SUMMARY OF YIELDS—PLANT, FIRST AND SECOND RATOON CROPS.

Treatment.	Plant Crop.		First Ratoon Crop.		Second Ratoon Crop.	
	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.	Tons.	Per cent.
Trash	19·1	16·3	39·5	14·0	30·9	15·7
No trash	18·6	16·7	34·7	14·5	29·0	15·2

DISCUSSION.

The second ratoon results are in conformity with those of previous crops, in that heavier yields were obtained from the plots on which trash was conserved. Doubtless the difference would have been greater had there been no death of stools in the trash plots.

The trash treatments will be continued when the land is again brought under crop.

FERTILIZER AND PLANT RESIDUE TRIAL (Plant Crop).

PLAN AND YIELDS.

PK 42.4	NK 35.0	C 28.3	NPK 37.8
NPK 37.4	C 31.8	PK 29.0	NK 36.3
NK 39.8	NPK 35.3	C 34.0	PK 33.5
C 40.7	PK 36.8	NPK 30.1	NK 36.9
PK 39.0	NK 39.7	C 34.1	NPK 34.6
NPK 37.7	C 41.2	NK 33.2	PK 34.1

Block.—E4.
Harvested.—September, 1939.
Age of Crop.—18 months.
Plots.—0·1074 acre.
Experimental Plan.—Six randomised blocks.

TREATMENT AND GROWTH NOTES.

This experiment is in its early stage, and at the present time represents merely a fertility trial. The land, prior to planting had a good crop of Poona pea, which was ploughed in January, 1938, and the block planted in February. The phosphate and potash were applied at planting time in the drill, but no nitrogen was applied to the plant crop. The experiment for the plant crop therefore becomes C, K, PK. In the ratoons, trash will be conserved on certain plots and not on others, and in the long-range rotation green manure is to be ploughed in on certain sections and not on others. This block survived the dry spell of the summer very well, even though it had made good growth earlier in the year and was carrying a fair crop at the time of shortage of soil moisture. The block, as shown by the results, is a variable one, containing patches of high and low fertility.

CROP YIELDS.

Treatments.	Check.	K.	PK.
Cane per acre, tons	35·0	36·8	35·6
C.C.S. in cane, per cent.	13·7	13·5	13·6

DISCUSSION.

As might be anticipated, little effects of treatment were recorded with the plant crop, and a period of years must elapse before it will be possible to make deductions regarding the full inter-play of the several factors involved in the experiment.

1939 CROP SUMMARY.

	Tons.
Cane sent to mill	757·5
Cane used for plants	9·2
Cane sold for plants	11·1
Cane used for test samples	3·0
	780·8
Total area harvested	24·3 acres.
Average cane tonnage per acre	32·1

REPORT OF THE COMMITTEE ON SEEDLING PROPAGATION.

By Mr. Arthur F. Bell, Assistant Director, Chairman.

During the period under review the varieties Q.10 and Q.20 were released for general planting in the Northern and Central districts respectively, while extensive seed beds of Q.25 (P.O.J.2875 × H.Q.409) were established in Southern Queensland with a view to its approval for general planting in 1941.

Although the canegrowing areas of Queensland extend through some eleven degrees of latitude it is only in the far northern, wet, tropical section that cross pollination can be undertaken with any measure of success. An arrowing field has been established at Freshwater, near Cairns, in a locality found by observation to be particularly suited to free arrowing. This field is situated about latitude 17° south, on good deep soil of the flood plain of the Barron River, a few feet above sea level. It lies about one mile from the coast at a point where the coastal range of some 3,000 feet elevation approaches within a few miles of the sea. A subsidiary field is also maintained at the Meringa Station, a few miles to the south. All cross pollination is done at Meringa or Freshwater and the necessary seed is later sent to the two more southern Stations for germination.

Owing to the restricted area from which the supply of arrows is necessarily drawn, local climatic variations very greatly influence the quality and range of seed available each year. It is in an effort to reduce the effects of this variability, by carrying forward seed from one year to another, that we have given so much consideration to the question of seed preservation and storage. An order has been placed for the provision of a special refrigerator for the storage of seed for prolonged periods and the seedling-raising equipment is now reasonably complete.

1940 Cross Pollination Season.

The following table sets out the comparative rainfall in inches and the number of wet days for the four months January-April, during the four years 1937-1940, recorded at Meringa:—

Month.	1937.		1938.		1939.		1940.	
	Rain in Inches.	Wet Days.	Rain in Inches.	Wet Days.	Rain in Inches.	Wet Days.	Rain in Inches.	Wet Days.
January	8·4	18	18·8	14	26·1	19	12·7	14
February	4·7	15	18·9	18	36·9	14	18·9	21
March ..	16·4	20	2·7	9	34·7	19	34·4	25
April ..	4·9	6	0·5	6	9·3	22	7·3	17
Totals	32·4	59	40·9	47	107	74	73·3	77

Arrowing commences in April; November and December are almost invariably comparatively dry in this area and hence rainfall for these two months has not been included in the above table. It is interesting to note that in the years 1937 and 1938 arrowing was poor, while it was excellent in the years 1939 and 1940; on the other hand, following these two years of heavy and prolonged wet season, the period of the arrowing was restricted, with the result that the actual cross pollination season was shorter than in 1937 and 1938. It is obvious that the nature of the wet season has an important bearing upon arrowing but it would appear that more than rainfall is involved. The 1940 season with 73 inches of rain on 77 wet days was accompanied by rather more prolific arrowing than the 1939 season with 107 inches of rain on 74 wet days.

The favourable arrowing season permitted the making of 151 combinations of parents as set out in the accompanying table:—

Female Parent.	Male Parent.
Atlas	H.Q.409, Q.33, Q.34, Q.39
Badila	Co.290, H.Q.409, M.1900S., Q.29, Q.30, Q.32, Q.34, S.C.12/4
C.P.29–116	P.O.J.2940
Co.270	Badila, E.K.28, H.Q.409, Q.34, Q.35, Q.39, Q.1098
Co.281	Pompey
Co.290	P.O.J.2878, Q.1098
Co.419	Co.421, P.O.J.2940, Q.34
Co.421	H.Q.409
H.Q.426	Co.290, J.B.11, Q.29
Korpi	Badila, Co.290, H.Q.409, J.B.1, J.B.3, J.B.11, Q.2, Q.30, Q.32, Q.39
Mahona	Co.290
N.G.16	K.5, J.B.1, J.B.3, J.B.11, Q.36, Q.39
N.G.24	H.Q.409, Q.36
Oramboo	H.Q.409, J.B.11, Q.29, Q.36
Pompey	C.P.29–116, Q.21, Q.30, 20S.16
P.O.J.100	H.Q.409, J.B.13, Q.39, 20S.16
P.O.J.213	Q.33, Q.36
P.O.J.234	Q.36
P.O.J.2364	Badila, E.K.28, J.B.13, M.1900S., Pompey, Q.35, Q.38, 20S.16
P.O.J.2725	Co.421, H.Q.409, Jason, J.B.13, M.1900S., Q.36, Q.38, 20S.16
P.O.J.2875	H.Q.409, Q.36, Q.38, 20S.16
P.O.J.2878	Badila, Co.290, E.K.28, H.Q.409, Q.29, Q.34, Q.36, Q.39, Q.1098, S.C.12/4
P.O.J.2883	Q.36
Q.20	J.B.11
Q.27	Badila, E.K.28, Q.32, Q.34
Q.37	Badila, Co.290, E.K.28, Q.34
S.J.4	Badila, C.P.29–116, Co.290, E.K.28, H.256, H.Q.409, Jason, J.B.1, J.B.11, K.5, Pompey, P.O.J.2940, Q.29, Q.30, Q.33, Q.34, Q.36, Q.38, Q.39, Q.41, S.C.12/4, Saretha, 20S.16
Uba	X.3, Q.39
I.140	E.K.28, Q.33
J.17	D.1135, Jason, Q.38, Q.39
J.22	Badila
J.B.3	Co.290
J.B.4	Badila, Co.290, E.K.28, Q.31, Q.32
J.B.8	Badila, Co.290, Q.32, Q.39
J.B.9	Q.31
J.B.14	Jason
K.39	K.5, M.1900S.
K.49	Co.290

The varieties designated "J.," "J.B.," and "K." in the above table represent local seedlings of the years 1937 and 1938 which have been selected for breeding purposes but which are not as yet sufficiently well tested for advancement to "Q." status.

In addition to the above combinations, nobilisations of *Saccharum spontaneum* Tank and *Erianthus arundinaceum* were attempted.

As in previous years male arrows were maintained wholly in solution (·01% SO_2 + ·01% H_3PO_4); 75 per cent. of the female arrows were maintained in this solution, while the remainder were left growing in the field. All solution crosses were maintained in the shelter of light forest adjoining the Meringa Station or in lanterns; the others were carried out at Freshwater. Over 500 arrows were transplanted a distance of 20 miles from Freshwater to Meringa for use in solution crosses; this was effected, without the loss of a single arrow, by the use of a long close-lidded box attached to the side of a utility truck. Female arrows in solution generally ripened very satisfactorily and losses were less than last year. All fuzz was dried in a current of warm air and gives promise of satisfactory germination, while sufficient for one year's seedling propagation will be carried over in cold storage until 1941.

1939 Series Seedlings.

Upwards of 21,000 seedlings were planted to the field on the three stations. The favourable arrowing season in 1939 had allowed a wide range of crosses and 36 families represented by more than 100 seedlings were planted at Meringa and 16 such families at both Mackay and Bundaberg. In accordance with previous policy no single family, or small group of families, constituted an undue proportion of the plantings. For the first time since the reorganisation of the breeding work we were able to plant out a satisfactory number of crosses in which Badila figured as one parent. It is evident from the progeny, however, that it is necessary to incorporate a proportion of "wild blood" in order to obtain generally improved vigour and Badila × noble progenies are not very promising. Selection of the 1939 series is now being carried out.

Selected Seedlings.

Selections from the 1938 series were planted out in the standard 40-sett plots for further selection, similar sized plots of standard varieties being evenly distributed throughout the field so that every seedling contacted a standard. Notes were kept on germination, early cover, stooling and other features, and these notes will be utilised in the forthcoming selections. The consensus of opinion of the observers making the selections is that the institution of the 4-row, 40-sett plots for second selections constitutes a very valuable advance over previous methods. This method of treatment has also been adopted for the early testing of newly introduced varieties from other countries.

Of the 96 seedlings selected for further observation at Meringa it is of interest to note that more than half were selected from families of Badila and S.J.4 crossed with a half nobilised *Saccharum robustum* (28N.G.251) seedling. Robustum seedlings of the second nobilisation were also well represented in the 70 seedlings selected at Mackay, and the family P.O.J.2725 × Co.290 was also prominent here. At Bundaberg the outstanding combination was P.O.J.2878 × Co.290 and nearly three-fourths of the 65 selected seedlings were of this family.

Yield observation trials for the further testing of second selection seedlings were planted out on the three Stations, as follows:—

Meringa: J.13, 14, 18, 25, 30, 31, 37 and 39, I.12, 16, 41, 67, 117, 118, 128 and 136; *Mackay:* G.43, 44, 47, 48, 49 and 53, H.18, 23, 33, 41, 43, 45, 59, 61 and 63; *Bundaberg:* G.10, 15, 16, 28, 32, 34 and 35, H.1, 3, 4, 6, 9, 10, 15, 16 and 23. Latin square trials with varieties selected from yield-observation trials were also planted at each Station, viz., *Meringa:* G.113, 126 and 243 and H.248; *Mackay:* G.17, 22, 39 and 58; *Bundaberg:* E.12, F.20, Q.20 and C.P.29-116. These trials will be harvested early in the season and the selected varieties will be planted out in farm observation plots.

It is the practice to preserve the identity of seedlings under pre-farm trial by allotting them a letter representing the year of crossing and a serial number. In the past each Station has worked independently in this matter with the result that there has arisen the likelihood of confusion of seedlings raised on different Stations but having similar numbers. Accordingly, commencing with the 1939 series, seedlings selected at Bundaberg will be allotted the numbers A.1 to A.100, Mackay A.101 to A.200 and Meringa A.200 +; the 1940 series will carry the key letter B, and so on.

Experimental.

Investigational work carried out over the past four seasons and now completed has perfected the technique of carrying out all-solution crosses under North Queensland conditions, at least with the majority of combinations. The Hawaiian solution of ·01% SO_2 plus ·01% H_3PO_4 has been found most satisfactory except, possibly, in the case of early arrows when it appears that the concentration of SO_2 might with advantage be doubled.

In spite of the reduction in spacing of crosses made possible by setting them up in light forest, the tending thereof and transport of large quantities of solution remain tedious and laborious. It appeared that the use of crossing "lanterns" might reduce this work very considerably, by permitting much greater reduction in spacing, and a considerable amount of experimental work has been carried out to this end during the past two seasons. The type of lantern decided upon differs from those used in other countries in that it is a permanent fixture and the crosses are brought to the lantern and not *vice versa.* To enable the movement of the arrows for the changing of the solution the lanterns are constructed in generous proportions. The frames are 3 feet x 3 feet x 4 feet deep, and are covered with a well-fitting envelope of cotton voile which extends below the frame, in the form of a skirt, for another 2 feet. The lanterns are mounted some 10 feet above ground level. The arrows are set up in the solution containers so that they project well into the lantern. Under these conditions the arrows keep quite well, pollination and seed setting are normal and, most important, the lanterns appear to be quite pollen-proof, so that batteries of them can be erected on the one framework and numerous crosses can be concentrated in a small area.

Fuzz storage experiments initiated in 1937 have also been concluded. All excess fuzz from the favourable crossing season in 1939 was stored over calcium chloride at a temperature of 43°F.. Seed from some seventy-one crosses was stored either at Cairns or Mackay and germinations made this season have been quite satisfactory in the majority of cases; a few crosses did not store well, and this appears to be characteristic of certain crosses, at least in certain seasons. During the current season advantage has been taken of the availability of stored fuzz in order to reduce the length of the germinating and potting season. That is to say, instead of waiting for the completion of the current season's late crosses (*e.g.,* those containing Badila), stored fuzz of late season crosses was germinated just prior to the germination of this season's early crosses; 1940 late season seed will be carried forward to 1941.

A preliminary experiment gave definite evidence that arrowing in the early free-flowering P.O.J.2364 and P.O.J.2725 could be delayed considerably by the simple expedient of removing the blades of all green leaves a few inches above the growing point on one, two, or three occasions during the summer growing period. The apical growing point is not damaged and arrows are produced normally. This experiment will be extended in the coming season and it is expected that the method will enable a much more extended use of these particular varieties which have often completed arrowing before any suitable male parents are available.

Treatment with chlorhydrin in dilute aqueous solution was carried out in an attempt to stimulate arrowing, but the results of the experiment were inconclusive.

Introduction of Varieties.

Reference to introduction of new varieties from abroad or from the neighbouring State of New South Wales will be found in the report of the Division of Entomology and Pathology.

Varietal Statistics.

In the appended table is set out a census of the varieties of cane harvested in the various districts during the 1939 season, together with the average yields per acre for each district.

It is of interest to note that the variety P.O.J.2878 has now advanced to second place of importance with a narrow margin of some 15,000 tons over 1900 Seedling. Other points worthy of note are that ten varieties constitute 90 per cent. of the State's total crop; the erstwhile standard D.1135 has dropped below 1 per cent.; and Queensland raised seedlings constitute some 20 per cent. of the total.

Queensland Cane Variety Census—Tons Cane Harvested, 1939.

Variety.	Mossman to Townsville.		Giru and Burdekin.		Mackay.		Bundaberg and South.		State Total.	
	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.	Tons.	Per Cent. Crop.
Badila	1,407,583	57·54	470,928	61·05	113,975	7·31	250	0·02	1,992,736	33·00
P.O.J.2878	116,465	4·76	37	..	52,381	3·36	568,476	45·02	737,359	12·21
M.1900 S.	127	..	350	0·05	685,142	43·96	36,772	2·91	722,391	11·96
E.K.28	..	..	149,408	19·37	250,052	16·04	..	..	399,460	6·61
Co.290	..	..	..	..	75,056	4·82	320,141	25·35	395,197	6·54
H.Q.426	189,309	7·74	59,812	7·75	125,041	8·02	..	..	374,162	6·20
H.Q.409	292,408	11·95	..	..	..	..	..	..	292,408	4·84
Q.813	57,585	2·35	188	0·02	93,265	5·98	38,022	3·01	189,060	3·13
S.J.4	158,134	6·46	16,170	2·10	10	..	..	..	174,314	2·89
P.O.J.213	..	..	..	..	2,332	0·15	140,633	11·14	142,965	2·37
S.J.2	11,331	0·46	18,935	2·45	61,999	3·98	..	..	92,265	1·53
Pompey	83,789	3·43	235	0·03	81	0·005	..	..	84,105	1·39
P.O.J.2714	1,473	0·06	3,585	0·46	52,487	3·37	11,160	0·88	68,705	1·14
Korpi	14,512	0·59	30,430	3·95	329	0·02	6,279	0·50	51,550	0·85
D.1135	22,670	0·93	..	..	159	0·01	26,029	2·06	48,858	0·81
Oramboo	12,022	0·49	125	0·02	12,284	0·79	13,174	1·04	37,605	0·62
P.O.J.2725	650	0·03	3,411	0·44	15,633	1·00	15,203	1·20	34,897	0·58
P.O.J.234	..	..	..	..	..	..	32,063	2·54	32,063	0·53
Q.2	22,725	0·93	..	..	..	..	..	..	22,725	0·38
H.Q.285	..	..	..	..	10,274	0·66	9,983	0·79	20,257	0·34
B.147	18,420	0·75	..	..	..	..	..	..	18,420	0·31
Juno	17,174	0·70	..	..	..	..	..	..	17,174	0·28
Uba	..	..	..	..	..	..	14,338	1·14	14,338	0·24
B.208	186	0·01	6,272	0·81	91	0·005	..	..	6,549	0·11
S.J.16	..	..	5,711	0·74	..	..	..	..	5,711	0·09
S.J.7	..	..	5,446	0·71	..	..	..	..	5,446	0·09
Vulcan	5,043	0·21	..	..	..	..	..	..	5,043	0·08
Mahona	..	..	..	..	..	..	4,751	0·38	4,751	0·08
Nanemo	4,483	0·18	..	..	..	..	..	..	4,483	0·07
M.189	263	0·01	..	..	2,433	0·16	1,608	0·13	4,308	0·07
Co.210	..	..	..	..	..	..	3,478	0·28	3,478	0·06
Malagache	..	..	..	..	1,214	0·08	..	..	1,214	0·02
Others	5,038	0·21	242	0·03	4,433	0·28	11,060	0·88	20,774	0·35
Total	2,446,320	100·00	771,285	100·00	1,558,672	100·00	1,262,696	100·00	6,038,973	100·00
Average Tons Cane, Acre	23·25		29·52		18·75		24·98		22·84	

REPORT OF THE DIVISION OF ENTOMOLOGY AND PATHOLOGY.

Mr. Arthur F. Bell, Assistant Director.

Introduction.

Last year we recorded the enactment of "*The Sugar Experiment Stations Acts, 1900 to 1938,*" which introduced new and far-reaching amendments in the principles of legislative control of diseases and insect pests of sugar cane. Certain difficulties have naturally been encountered in the transition period from the old to the new regime, but conditions are rapidly becoming stabilised and the current season will, it is expected, see the transition completed. The benefits of more strict control of cane varieties have become obvious, while the ever-increasing yields of sugar per acre indicate that no detrimental economic effects result.

Following the upward trend of the past few years a favourable season resulted in a further increase in cane grub pest populations in North Queensland; damage was greater than it has been for some time past and, in the absence of soil fumigation campaigns, would have been very extensive. In view of the wartime difficulties of obtaining adequate fumigant supplies it is to be hoped that a climatic check will be imposed upon this pest this season.

The disease situation has continued to improve in Southern Queensland, chiefly owing to the expanded activities of Cane Disease Control Boards. These Boards have more than justified their constitution under the Sugar Experiment Stations Act, and are providing a valuable service to the sugar industry.

Cane Pests and Cane Disease Control Boards.

Two further Cane Disease Control Boards, viz., Mossman and Hambledon, were constituted during the year. Eight such Boards are now functioning; the activities are being directed in each case by qualified supervisors, who are bringing energy and enthusiasm to bear upon their work.

The sixth annual conference of Cane Pests Boards was held in Ayr on 12th June, 1940, and was attended by the record number of forty-four delegates, representing sixteen Boards. Nine papers dealing with various aspects of pest control were read and discussed. A considerable amount of interest centred upon an address by Mr. H. E. Lever, Technical Officer of Messrs. A. C. F. and Shirleys Limited, who was present, by invitation, to discuss the problem of obtaining adequate supplies of fumigants and poisons during wartime.

The Greyback Cane Beetle (*Lepidoderma albohirtum* Waterh.).

The rapid increase of the greyback beetle in most of the Northern cane areas during the last year greatly outstripped the previous steady rate in the build-up of populations which was commented on in last year's report, and the grub position during the past season was such that serious losses occurred in many mill areas.

These losses did not occur despite fumigation, but rather through failure to fumigate. Although most of the mill areas have fallen into line and adopted the policy of soil fumigation as their method of front-line attack on the grub pest wherever serious infestations occur, some found their infested areas so great that available supplies of fumigant were totally inadequate to deal effectively with all the areas that needed attention, and supplies had to be rationed. Reserves that had been built up in other areas were freely drawn on until stocks were depleted, and the remaining untreated infestations were left to take their chance. Many fields therefore became almost a total loss, whilst others, in sections that received late deliveries of fumigant and were not treated at the optimum time, suffered serious checks. Another aspect which cannot be overlooked (and which, incidentally, will have an important bearing on next year's infestation) was the existence of extensive areas of light infestation which were not sufficiently severe to warrant fumigation but where, nevertheless, appreciable crop losses did occur. It has been estimated that the total acreage fumigated in North Queensland from Mossman to Tully was in the vicinity of 1,900 acres, which represents a considerable increase over that of previous years.

Fumigant deliveries were somewhat disorganised as a result of the war. This difficulty is expected to be overcome before the commencement of the next campaign by a co-operative effort on the part of the Pests Boards and the manufacturers, whereby orders will be placed early and supplies will be despatched whenever shipping space becames available. The full quota for each mill area is therefore likely to be built up well in advance.

Considerable difficulty was experienced in the actual conduct of fumigation operations, due to the protracted beetle flights. This state of affairs is always likely to eventuate when early summer rains occur, and it places on the Supervisor the responsibility of advising the optimum time for fumigating mixed age groups.

Where the largest infestations resulted from early beetle flights, they were easily and effectively fumigated before the onset of the continuous monsoonal rains; but where the infestations were late the sodden condition of the soil rendered fumigation impossible, and necessitated delay until drier weather conditions were experienced, with consequent reduced efficiency. As a result of the development of the Blundell knapsack injector (referred to in a previous report) a large number of these units were used in various centres throughout the last fumigation campaign and the results were most gratifying. Not only did these injectors have less stoppages through mechanical defects or obstructions, but the dosages remained more constant; they were easier to manipulate, and the man-day performance was increased by approximately 100 per cent. over that obtained with the previous type. This serves to bring the campaign within limits closer to the optimum period or, alternatively, a larger acreage can be treated in the time previously occupied. Labour costs were reduced from approximately £2 10s. per acre to about £1 5s., and, as a result, these knapsack injectors are quickly displacing the older type of injector.

Speeding-up of the fumigating season has been carried a step further in the Mourilyan three-unit carriage machine by the provision of a battery-lighting set which flood-lights the base of the stools as the machine is drawn slowly along the cane rows, and so allows work to be undertaken during the night period, when conditions are cooler and more comfortable for the operators. The Sugar Workers' Award has been amended so that such work may proceed until midnight, making it possible to work two shifts with the one machine.

It is gratifying to note that some of those who were the greatest opponents of fumigation, when faced with ruin in the shape of ever-decreasing tonnages, low sucrose yields, and the replanting of large acreages annually, and having successfully tried fumigation, have now become some of the greatest advocates of this form of control. However, there still remain a few who appear loath to do anything to circumvent the pest other than by indirect methods, and it cannot be too strongly emphasised at this juncture that the large populations built up over extensive areas during the past year will, in their turn, give rise to even heavier infestations during the coming year if weather conditions should again prove favourable. Hence growers who have previously experienced depredations of this pest would be wise to heed this warning and make appropriate plans to cope with any anticipated infestation.

Attention has again been focussed on the cane area on the eastern side of the Basilisk Range where a tree-clearing project was initiated some few years ago, and it was of interest to note that many of the farms previously infested have, since the clearing of this range, remained free of the pest. At the same time farms to the south, where feeding trees still remain, and other farms elsewhere in the Mourilyan area have suffered heavy infestation. Such a state of affairs gives increasing support to the idea that this area will probably remain permanently free of the pest as a result of the elimination of the feeding trees.

Since this scheme has up to the present apparently justified itself, other tree-clearing schemes have been commenced, whilst others are being fostered or are under consideration. If successful, and not unduly costly, such tree-clearing projects eliminate for all time the necessity for undertaking any artificial control measures, but each scheme must be judged on its own merits. Undoubtedly areas of feeding trees from which canelands now become infested do occur, and by a co-operative effort some of these lands would profit by a destruction of the feeding trees. On the other hand, on account of the wide distribution of the feeding trees in some areas any scheme for the protection of the few adjacent canelands must surely prove uneconomic, and it must still be remembered that one of the earliest of such schemes proved a failure. All factors such as the possible flighting range of the beetles and the existence of any natural barriers, such as hills to obstruct their flight, should be taken into consideration when assessing the possible value of a projected scheme.

The elimination of the grub-resistant variety S.J.4 as a result of the outbreak of gumming disease in the Mulgrave and Hambledon districts has resulted in a concentrated search for replacement varieties. Trial plots of such varieties were examined to check their resistance to grub attack during the past season. Under the conditions of moderate infestations P.O.J.2725 exhibited a considerable degree of resistance; P.O.J.2878 showed less resistance than P.O.J.2725 but considerably more than the susceptible varieties Badila, Korpi, and Oramboo. Q.10 is susceptible and appears to attract larger numbers of beetles by virtue of its vigorous early growth habit; Q.29 on the other hand appears unattractive to beetles owing to its rather sparse early growth. Co.290

behaved similarly to P.O.J. 2878. The above observations were made during a particularly wet season when grubs tended to be located near the surface and thus root pruning took place near the surface; under drier conditions the relative reaction may be somewhat different.

Canes which have been subjected to root pruning by grubs suffer deterioration in juice quality but it has been observed that the rate of deterioration varies with the extent of the damage and from variety to variety. In an investigation of this factor fifteen varieties were planted at Meringa and subjected to three treatments, viz.: *a* check; *b* spaded (to simulate partial root pruning) at bi-weekly intervals from March onwards; *c* as in *b* but completely uprooted in May. Maturity tests commenced in May are being continued at intervals. The early analyses have shown an increase in C.C.S. for the spaded sections but a decrease for the uprooted canes; it would appear, however, that care must be exercised in interpreting the results.

Infestations in the Mackay district were generally much lighter than in the period 1936-39; on the other hand, the extended wet season, followed by continued dry weather, reduced the number of grubs per stool necessary to inflict economic damage. As a result, fields which experienced infestations of similar intensity in both years suffered considerably more damage this year. After a number of years of heavy pest populations and extensive grub damage the Mount Jukes district experienced a sudden and spectacular disappearance of general grub infestations; the few present were confined to relatively small areas and were adequately dealt with by fumigation.

On the other hand there were some *apparent* extensions of areas of grub damage due to recent extended plantings of the very susceptible variety S.J.2. This variety suffers obvious damage from populations which did not visually affect the varieties it has displaced and hence the tendency to conclude that new areas of grub infestation have occurred. Mackay farmers who contemplate further plantings of S.J.2 in blocks which might be infested by grubs should be prepared to conduct annual fumigation campaigns if necessary.

The Mackay Cane Pests Board ceased paying for the collecting of beetles early in January, 1940, and hence last season's main flights were not interfered with. The Board then initiated its first large-scale fumigation campaign, the newly-appointed Supervisor being assisted in an advisory capacity by officers of the Bureau. A total of 160 acres were fumigated on twenty-four farms distributed over several districts. Adverse weather conditions, irregular supplies of fumigant, and the occasion of more than one flight of beetles added to the difficulties of organising the campaign; nevertheless, the results were satisfactory and already a large number of farmers have signified their intention of participating in this form of grub control next season. The mixture of carbondisulphide and paradichlorbenzene has been made the standard fumigant in this district on account of there being usually more than one flight of bettles.

A considerable amount of attention has been devoted to the problem of obtaining varieties more resistant to grub attack to replace the discarded P.O.J.2878 in parts of the Mackay district and all new varieties are now being tested for grub resistance. The grub resistance of present commercial varieties in the Mackay district is as follows:—

Resistant: P.O.J.2878 and P.O.J.2714.

Intermediate: E.K.28.

Susceptible: 1900 Seedling, H.Q.426, Badila, Oramboo, Korpi, Q.813, Q.20, and S.J.2.

The Beetle Borer (*Rhabdocnemis obscura* Bois.).

In most of those areas that normally suffer badly from depredations by the beetle borer, damage from this pest has been rather moderate during the past year, in spite of the fact that very wet conditions prevailed. However, in localities where the damage from borers is generally most severe, the incidence of top rot was not nearly so marked during the past season as it has been in some of the previous years, and this is probably the reason why the borer pest did not prove more troublesome. Nevertheless the infestion that usually accompanies flood-damaged and rat-damaged cane remained at a normal level.

In accordance with the customary practice, a beetle borer-*cum*-top rot resistance trial was established in the South Johnstone area with third year seedling selections from Meringa Experiment Station; however, only a low percentage of top rot was recorded there and preharvest inspections did not indicate that there would be a high borer population in any of the varieties, including Badila.

From one locality reports were received of borers operating in grub-damaged cane. This was not unexpected since it has been observed on previous occasions that cane which is damaged by grubs is more susceptible to borer attack than undamaged cane. One possible reason for this is the fact that early maturity or over maturity and deterioration induced by severe grub attack exerts an attraction on the borers and tends to make them concentrate in the grub-damaged cane.

The Giant Toad (*Bufo marinus* L.).

It would appear that populations of the Giant Toad have now reached saturation point in many Northern areas and although some growers affirm that at least in localised areas the toad is coping with the greyback beetle, in general it appears evident both on the score of observations in the field, and by virtue of the fact that grub damage has increased this year in areas where the toad population is high, that the number of beetles destroyed by the toad is relatively small when compared with the numbers that are nightly on the wing.

Examinations of the contents of toads' stomachs during the beetle flighting season were continued, and in a number of instances the remains of greyback beetles were found. However, even if the diet had consisted exclusively of beetles the number of toads present in the field was insufficient to effect a material reduction of the pest. This scarcity of toads in the field is not to be wondered at considering the absence of any debris or other cover which might serve as shelter for them during the day.

Evidence seems to indicate that the toad may be of more value in the reduction of beetle borer (*Rhabdocnemis obscura* Bois.). In the wetter areas where this pest thrives the toad population is more numerous in the canefields and it is believed probable that it may be particularly effective in dealing with migrating beetle borers.

The Sugar-cane Scale (*Aulacaspis madiunensis* Zehnt.).

Following reports of further severe infestations of the sugar-cane scale, *Aulacaspis madiunensis*, in the Bundaberg district, a comprehensive survey of the incidence and habits of this pest was undertaken in September, 1939. Information gleaned during this survey definitely establishes the existence of this scale in parts of the Bundaberg district prior to 1918. Fortunately it does not seem to have dispersed far from the older centres of infestation. Damage occurred in standover crops exclusively, and the insect was found to colonise only sparsely on crops up to the age of one year. One-year-old crops were standard practice up to some five or six years ago and it is considered that this explains why the pest made no headway and remained undetected. However, since the advent of irrigation, the success of P.O.J.2878 as a standover variety, and the attendant problems of over-production, standover cane has constituted a large percentage of the crop, and conditions have become favourable for the spread of the pest. Incidentally this demonstrates how the status of a minor pest can suddenly become altered under the conditions of a new economy.

The variety P.O.J.213 was the worst affected, followed by P.O.J.2878, whilst P.O.J.2725 and Co.290 appear to be fairly resistant to attack. Susceptibility or resistance to attack seems to follow no distinct breeding lines. Hence it was decided to put all promising new canes in South Queensland into a resistance trial to test their reaction to this pest, and a trial was accordingly established at South Kolan during the last spring.

Recommendations included the burning of affected blocks and the elimination of the variety P.O.J.213, which appears to have been largely instrumental in building up infestations. As this variety is more suited to a one-year cropping programme, and was fast losing the limited popularity it possessed, its loss will present no great hardships in the areas affected.

Wireworms (*Lacon variabilis* Cand.).

During the spring of 1939 many bad, indifferent, or slow strikes were experienced in canefields on several soil types in the Mackay district. Numerous field enquiries revealed that these were chiefly due to various combinations of unfavourable soil and climatic conditions and the varietal factor. Authentic wireworm infestations were relatively few and seldom severe and, consequently, a project for the study of field populations by mechanical soil sifting did not yield much useful information.

Over the period December, 1939-January, 1940, 52.23 inches of rain were recorded on forty-six wet days at the Mackay Experiment Station. A warning was therefore issued to farmers that severe and widespread damage could be expected during the forthcoming plantings. Actually, however, the autumn climatic conditions have been such that virtually no autumn planting has been carried out on wireworm country.

Rats.

During the past year the incidence of the rat pest in Queensland cane fields was again very low, and few fields showed evidence of appreciable economic damage. Most of the damage caused was due to the two species *Melomys littoralis* and *M. cervinipes*. Routine investigations of the problem of control were continued throughout the year. Some phases of this preliminary investigation have now been carried as far as is practicable and preparation of data for publication is in hand.

Some investigational and check-trapping work was carried out in the more northern parts of the State during the spring. In most of these districts the Pests Boards carry out extensive poison campaigns each year and considerable sums of money are expended in this way.

Gumming Disease (*Bacterium vasculorum* (Cobb) Grieg-Smith).

The only observations of gumming disease reported during the year were in the Mulgrave, Hambledon, and Moreton districts. Some diseased fields of the rapidly disappearing H.Q.285 were reported from the Moreton Mill area; it is proposed to remove this susceptible variety from the approved variety list for 1941.

As must be expected, there has been further spread of the disease in the Mulgrave Mill area, but it has become less intense as more fields of the now non-approved S.J.4 are ploughed out. A somewhat disquieting feature of the year's experience has been the spread of the disease from S.J.4 into more resistant standard varieties such as Badila and H.Q.409. However, it is felt that once the infection centres of S.J.4 have been removed these commercially resistant varieties will suffer little further damage, especially as the Mulgrave Cane Disease Control Board is pursuing a vigorous policy of control of planting material. By the end of the current season most of the disease-affected fields of S.J.4 will have been ploughed out.

A considerable amount of spread of the disease in the Hambledon area followed the long and favourable wet season, particularly in those sections where there is an almost solid area of S.J.4. Owing to the predominance of S.J.4 at this mill it was felt that it would be a hardship if this cane were suddenly disapproved over the whole area, and accordingly the 1940 list of approved varieties permitted the planting of S.J.4 in the southern section where no gumming had been found. Unfortunately, the disease has now been found in this particular area, and it will be necessary to disapprove plantings of S.J.4 entirely. Extensive trials with new varieties are being carried out in this area.

A gumming resistance trial conducted at Bundaberg included mainly Bureau seedlings and some Co. canes; it is of interest to note that Co.515, a cross between P.O.J.2725 and sorghum, suffered more damage than the included susceptible standards. Q.13, Q.20, and the Hawaiian 31-1389 appeared highly resistant, Q.10 commercially resistant, Q.2, 26, and 27 too susceptible for Southern Queensland conditions, and Q.19 highly susceptible. A current uncompleted trial in the Brisbane pathology plot indicates that Q28, Q.29, and the Hawaiian importations 28-4291, 31-2484, 31-2806, 32-1063, 32-3575, and 32-8560 are satisfactorily resistant, while Pompey (7R.428) and H.Q.458 may prove somewhat susceptible.

Fiji Disease.

The Fiji disease situation in Southern Queensland is rapidly improving, due to extensive and sustained disease control campaigns being carried out by the Bundaberg, Isis, Maryborough, and Moreton Cane Disease Control Boards.

Most areas, and certainly all suspected areas in the Bundaberg district, have now been thoroughly inspected. The disease was found on a further fifty farms and plantations, bringing the grand total of diseased farms and plantations to 170 as at 30th June, 1940; most of the new records were on farms not previously surveyed and the net spread of the disease has not been great. On the other hand, a considerable number of these fields have apparently been cleaned up and many of the year's positive records are based on the finding of only odd stools. Some twenty-one disease-eradication orders, covering 126 acres, were issued during the year; this number will be materially reduced for the coming season. Plant cane is very free of disease and, following conditions unfavourable for spread in the autumn of 1940, it is expected that the third year of the Disease Control Board's operations will see this disease eliminated as a direct economic factor.

The operations of the Isis Board have confined the disease to insignificant proportions. The greater incidence of the disease necessitated the disapproval of highly susceptible varieties in certain parts of the Maryborough district, but, in consequence, the situation is now rapidly improving; this fact, together with the measure of control now instituted by the Maryborough Board should permit at least a partial relaxing of restrictions within the next two years. The Moreton Board has only been in operation one year and, owing to the large percentage of standover cane, the full effects of its work will not be seen until 1941. In the meantime, valuable ground has been gained by close supervision of planting material and current plant crops are in an excellent condition. During the year, thirty-two plough-out and twenty harvest orders, affecting 156 acres, were served upon farmers in this district. A recent survey has also indicated that the position is much improved in the Logan district.

Some further investigational work has been initiated in respect of this disease, mainly with a view to determining the relation of numbers of hoppers to transmission and methods for the handling of leafhoppers used in transmission trials.

Current resistance trials have demonstrated that the P.O.J. canes transmit susceptibility to Fiji disease to a high proportion of their progeny but, nevertheless, some highly resistant seedlings result.

The usual resistance trial was completed during the year and gave the following results for the named varieties:—

No infection—Co.352, Co.355, and Co.356.
0-10 per cent.—Q.42, Q.43, and Q.813.
10-20 per cent.—Q.2 and S.C.12/4.
20-40 per cent.—P.O.J.2878 and D.1135.

A number of new seedlings was also included, but their reactions are of no more than local interest at this stage.

Downy Mildew (*Sclerospora sacchari* T.Miy.).

Downy mildew continues, directly and indirectly, to be the most important sugar-cane disease in Queensland and, during the period under review, was reported from the Mossman, Cairns, Lower Burdekin, Mackay, and Bundaberg districts.

At Mossman the disease has been found on eleven farms, confined to the Cassowary area; the variety chiefly affected was P.O.J. 2878, with some consequential infection of Q.2, Pompey and S.J.4. Plough-out orders, together with frequent inspections on the part of the Supervisor of the newly constituted Mossman Cane Disease Control Board, have brought the disease under control. Six Mulgrave farms (at Aloomba, Highleigh, and Meringa) and one Hambledon farm were reported diseased, B.147 being the variety chiefly affected; diseased maize was also found on six farms. Prompt action by the respective Disease Control Boards has resulted in the outbreaks being apparently brought under control.

Following the appointment of a Field Supervisor and assistants by the Mackay Disease Control Board some 16,000 acres of young plant and ratoon cane was inspected for downy mildew and rogued where necessary; a considerable proportion of this area received a second and sometimes a third inspection. In addition, there were served (on eighty-five farmers) ninety-nine plough-out orders on 406½ acres and twenty-four harvest orders on 73 acres. Of the total of 479½ acres, P.O.J.2878 comprised some 400 acres, P.O.J.2714—42 acres, Co.290—26 acres, other varieties—11½ acres. Three farmers who failed to comply with these orders were prosecuted and fined £5 each.

Owing to the extent to which the infected fields of the minor variety P.O.J.2878 were transmitting the disease to fields of the more resistant standard varieties, it was adjudged necessary in 1938 to prohibit the further planting of P.O.J.2878 over most of the Mackay district, and the obvious menace created by the residual fields of ratoon P.O.J. 2878 has demonstrated the wisdom of that move. The current year's harvest will therefore eliminate most of the remaining fields of this variety. As a result of the roguing campaign and the issue of disease-eradication orders intensity of infection has been very much reduced, but the unfortunate infection of the standover varieties will demand the utmost vigilance on the part of the Disease Control Board. Spot inspections have failed to indicate the presence of downy mildew in the Plane Creek area, while prompt ploughing out of diseased cane has rendered North Eton virtually disease free.

The outstanding grub resistance of P.O.J.2878 has made this a particularly valuable variety in the grub-infested "North Coast" section of Mackay. A particular effort has been made by both the Bureau and the Board to keep the variety disease free and so maintain it in this section and, with the exception of Owen's Creek, the area is still apparently downy mildew disease free.

Although the total number of known downy mildew diseased farms and plantations in the Bundaberg district increased from 175 to 225 in the period under review, the situation has very greatly improved, this increase being mainly due to the completion of comprehensive district-wide surveys. A very extensive inspection and roguing campaign was carried out by four gangs employed by the Bundaberg Cane Disease Control Board; in addition plough-out orders (37) and harvest orders (22) affecting 393 acres were served on the farmers of the district. As a result of this campaign the intensity of the disease has been greatly reduced; during the critical period November-February the number of diseased stools per unit area of diseased fields in 1939-40 was but one-sixth of the number found during the same period in 1938-9. The late summer and autumn of 1940 have been unusually dry and this factor, coupled with the continued control campaign, should ensure a very satisfactory position in 1941.

Field observations have indicated that the maximum distance of spread is somewhat greater than was previously thought. There have been a number of instances when the distance over which spread has taken place has been a good quarter of a mile while in a couple of cases there is a suggestion that spread has taken place over a distance of a mile; that is to say, no diseased cane or alternate host plants have been observed within that radius, although it must be conceded that odd plants could escape detection.

A comparison of the number of diseased stools found by the inspectors per unit area indicates that the most susceptible varieties are P.O.J.2878, P.O.J.213, P.O.J.234, and D.1135 (in that order); Co.290, P.O.J.2725, Q.813, and 1900 Seedling are fairly resistant under Bundaberg conditions; Mahona (N.G.22), grown only on the river flats, is fairly susceptible.

The surveys have indicated that as a general rule late harvested ratoons develop more downy mildew than ratoons from cane harvested early in the season. There appear to be two reasons for this: *a*, early cut cane is often harvested before the causal fungus has penetrated down to the crown of the stool and the diseased stool is cured by excision; *b*, ratoons of late cut cane are exposed to heavier sources of infection while they are still young and thus more susceptible; the latter is probably the more important reason.

Further alternate host investigation was carried out with various varieties of maize (*Zea mays* L.) teosinte (*Euchlaena mexicana* Schrack) and the grain sorghums American Early Red, Coleman, Manko, Schrock, Hegari, and Atlas. As in the previous year all maize early became badly infected as also did teosinte. No definite symptoms were observed on the sorghums in Brisbane, but at Bundaberg there was fairly heavy infection of American Early Red with slight but definite production of conidia; unconfirmed leaf markings were developed on Schrock. At Mackay one plant of Coleman developed mildew while other plants showed suspicious markings. It is evident from the above that the general level of resistance of these grain sorghums is much superior to maize. Attempts to transmit the disease in maize by planting seed from diseased plants, were without result.

An experiment in ratooning of P.O.J.2725 indicated that the susceptibility of the variety was greatly increased by ratooning in summer.

Hot water treatment of diseased can setts for 20 minutes at 52°C. gave partial control of the disease, while 20 minutes at 54°C. and 10 minutes at 56°C. appeared completely effective.

Various attempts to transmit the disease to maize and sugar-cane by the use of oospores have so far been unsuccessful, as also have been attempts to germinate the oospores *in vitro*. A very considerable study of histology and comparative morphology of the causal fungus has been carried out and will form the subject of a separate publication. Further confirmatory work on temperatures of sporulation, as reported last year, were also carried out.

Resistance trials were carried out at Cairns, Mackay, and Bundaberg. The Cairns trial included some twenty-four seedlings under selection as well as various Q. seedlings and standard canes. In the latter two classes the following results were recorded:—

No infection—Q.13, Q.29, Badila, H.Q.409, and H.Q.458.

0-10 per cent.—Q.2, Q.19, S.J.4, H.Q.426, Oramboo, Korpi, P.O.J.2725, and B.147.

10-25 per cent.—Q.10, Q.44, Pompey, D.1135, Co.290.

25-50 per cent.—Q.27, P.O.J.213, P.O.J.2878.

Over 50 per cent.—Co.419, P.O.J.2940, and S.J.16.

Owing to somewhat unfavourable conditions the Mackay trial yielded inconclusive results, although certain seedlings under selection gave indications of being quite susceptible.

In the Bundaberg trial the following results were recorded in named varieties:—

No infection—Q.20, Q.29, Atlas, Juno, Oramboo, 90 Stalk, E.G.1, Co.515, and Erianthus.

0-10 per cent.—Q.10, Q.13, Q.27, Q.43, Q.813, 1900 Seedling, P.O.J.213.

10-25 per cent.—Q.23.

25-50 per cent.—Co.356 and 31-1389.

Over 50 per cent.—P.O.J.2878.

The relative infection of the variety P.O.J.213 as recorded above is distinctly anomalous and ordinarily it would be expected to fall in the penultimate class. However, both plots were badly grown and this probably accounts for the cane "escaping" infection.

Owing to the serious menace to sugar-cane crops constituted by downy mildew diseased maize crops it has been necessary to exercise some control over the cultivation of maize in the Bundaberg area. A recent proclamation provides that maize may only be planted and grown in that district if a written permit has previously been obtained. Such permits are not granted in cases where downy mildew disease is known or suspected to be in the immediate vicinity of the proposed planting.

Chlorotic Streak.

The distribution and relative importance of this disease remains as in previous years; field observations indicate that there may at times be a considerable amount of recovery from the disease (or at least complete masking of any symptoms). Experiments with the warm water treatment of diseased cane setts were continued and it was found that setts of Badila averaging 3·75 cm. diameter, and pre-heated for 2-3 minutes, gave rise to apparently healthy plants after immersion in water at 44°C. for 20 minutes. In another trial individual buds on diseased stalks were selected at random and the buds, only, treated with flowing water at 52°C. for 20 minutes; 17 of 23 untreated buds gave rise to diseased plants as compared with 14 treated buds. This suggests that the "infection" is not restricted to the bud.

In contrast to the treatment of individual buds, selected portions of an individual stalk, extending over several nodes, were set in a rubber sleeve and water treated for 20 minutes at 52°C. Half the stalks had the tops removed before treatment while in the other half the top was left intact; transpiration of the latter was allowed to proceed for 18 hours after treatment, the butts being immersed in water. Results to date show complete control in the treated sections of both series while the eyes above and below the treated sections gave rise to diseased shoots.

Measurements of internal stalk temperatures—made with a thermo-couple—have been carried out on stalks of standard varieties placed in the sun on black cloth or galvanised iron. During a period when Stevenson screen readings ranged from 25·8°C. to 33·3°C. the internal temperatures of the canes reached 42·5°C. to 48·5°C. after 2½ hours exposure. An interesting observation made during the experiment was the poor longitudinal conducting power of sugar-cane; readings made on portion of the stalk exposed to sunlight for four hours were often 7-12°C. higher than in the shaded portion of the stalk a few nodes distant. Internal temperatures of stalks growing in the field were measured and it was found that under conditions of shade temperatures of 27-27·5°C., the internal temperature of sprawling cane reached 44·5°C. although erect, well sheltered canes did not become so warm. Poor conductivity within the stalk was again evident despite the continuous upward movement of the transpiration stream.

A further series of mechanical inoculation of cane setts was attempted, using extracts from mature leaves, young leaves, heart, stalks, and roots of diseased plants, but results have been negative.

Last year it was reported that in an experiment where healthy cane was planted in different months, but all ratooned in August, there was a much greater amount of the disease in the stools which were planted late. This experiment was repeated in 1939, monthly plantings being made from May to November; portion of the cane planted in May was ratooned in the following July and thereafter at monthly intervals until November. Cane ratooned in November showed 40 per cent. diseased stools, whilst that ratooned in October showed 12 per cent. The whole plot will be ratooned during the current season.

Observations on insects feeding in this plot have been made continuously and certain of these insects have been collected and released on healthy cane in isolated plots; results, if any, should be available after the cane is ratooned late in this season.

Leaf Scald.

Leaf scald has been somewhat more in evidence in North Queensland following the more extended planting of the gumming-resistant variety Oramboo and farmers will require to exercise more care in cutting plants.

The usual routine resistance trial was carried out in the west section of the Mulgrave area. The varieties included therein consisted mainly of unnamed seedlings under trial and are therefore of little interest at this juncture. In standard or named varieties the following percentage of infected stools were produced from sett inoculation:—

—	Per Cent.	Symptoms Appeared.
Badila	42	Mid- to late-season
H.Q.426	92	Early- to mid-season
D.1135	7	Early-season
Mahona (N.G.22)	75	Mid-season
Oramboo	36	Mid-season
Cato	17	Mid-season
H.Q.409	45	Continuously
Jason	6	Late-season
Q.29	12	Mid-season
Erianthus	5	Early-season

Although an appreciable amount of natural secondary spread occurred in last year's trial it was again below 1 per cent. in this trial.

Miscellaneous Diseases.

A few stools of dwarf disease were found in the Mackay district on four farms at Te Kowai (E.K.28), Alexandra (P.O.J.2714), Mirani (E.K.28), and Sarina (P.O.J.2878). These farms are in areas where the disease does not normally occur, and there is no record of the plants on these farms having been taken from a suspected area. It should be noted

that the wet season was particularly heavy in Mackay this year, and normally dry areas approximated to the wet, swampy conditions characteristic of the section where dwarf disease has heretofore been found.

Red stripe and rind disease were less in evidence than usual in North Queensland, although at Mackay there was rather more red stripe than usual.

An experiment with the cross inoculation of possible strains of mosaic failed to give any evidence of the existence of any such differential strains.

Cultures of Nitrogen Fixing Bacteria.

Some seventy-six canegrowers were supplied with Rhizobium cultures sufficient to inoculate 381 bushels of Poona pea seed, and 83 bushels of other cowpeas. Small quantities of culture were also supplied for the inoculation of lucerne, lupins, field peas, and Pueraria.

Introduction of Varieties.

Importations of varieties from abroad comprised:—Uba Marot and Hind's Special from the United States; these canes will be used for breeding purposes following a recommendation by Mr. N. J. King on his return from the Louisiana Conference of the I.S.S.C.T. Varieties were also received from the Hawaiian Sugar Planters' Association as under:—

28-4291 (Hawaiian Uba x H.456).
31-2484 (P.O.J.2878 x (Uba x H.456)).
31-2806 (P.O.J.2878 x H.9811).
32-1063 (P.O.J.2878 x 28-4399 (= Hawaiian Uba x H.456)).
32-3575 (28-4898 (= Natal Uba x H.456) x 26.C.270).
32-8560 (Co.213 x P.O.J.2878).

The following varieties were also received from the Colonial Sugar Refining Company:—28R.154, 28R.155, 29G.706, 32G.1374, and 33S.N.1270.

DIVISION OF MILL TECHNOLOGY.

Mr. E. R. Behne, Mill Technologist.

Staff.

The classification of Mr. E. R. Behne was changed from that of Chief Assistant Technologist to that of Mill Technologist, whilst Mr. L. C. Home, who previously was Temporary Laboratory Assistant, was placed permanently on the staff.

Mutual Control.

The Eighth Annual Synopsis of Mill Data for Mills in the Mutual Control, giving the figures for the 1939 season, has been published. Again twenty-four mills were incorporated in the scheme. The calculation sheets for the 1940 scheme have been revised and issued. The sheets are materially the same as those for the previous year, save for a minor alteration to the latter half of the reference numbers.

Standardisation of Apparatus.

The following is a record of the standardisation work carried out during the year; this work forming an important part of the interseason activities:—

Brix Spindles.—473 spindles were tested, and all conformed to official requirements.
Polariscope Tubes.—33 were tested, 3 of which were unsatisfactory.
Polariscopes.—4 instruments were checked and adjusted.
Pipettes.—Of 191 pipettes tested, 30 were rejected.
Burettes.—13 were tested and found satisfactory.
Cylinders.—34 were tested and found satisfactory.
Flasks.—291 were tested, and 14 of these were condemned.
Thermometers.—3 were tested, all being satisfactory.
Weights.—6 sets were tested and adjusted when necessary.

In all, 1,048 pieces of apparatus were tested, compared with 578 for the previous year.

Technical Papers.

Six papers were presented by the Technology Staff of the Bureau at the Eleventh Annual Conference of the Queensland Society of Sugar Cane Technologists. These were as follows:—

Behne, E. R., "The Commercial Cane Sugar (C.C.S.) Formula in Relation to Factory Control."
Behne, E. R., "The Storage of Raw Sugar."
Jenkins, G. H., "Cane Preparation."
Praeger, A. H., "Notes on the Crystallization of High Grade Massecuites."
Clayton, J. L., "An Aid to the Calculation of Pol in Juice Analysis."
Clayton, J. L., "The Conditioning of Sugar for Bagging."

Technical Communications.

In the current year the following Technical Communications were prepared and published by this Division:—

1939.—Technical Communication No. 5—"Subsider Performance Tests, 1938 Season," by G. H. Jenkins.
Technical Communication No. 6—"Furnace Investigations, 1938 Season," by G. H. Jenkins.
Technical Communication No. 7—"Surplus Power from Surplus Bagasse," by G. H. Jenkins.
Technical Communication No. 8—"Massecuite Dilution Tests," by G. H. Jenkins.
Technical Communication No. 9—"Some Physical Properties of Molasses," by A. H. Praeger and J. L. Heron.

1940.—Technical Communication No. 1—"Cane Preparation. Part I.—The National Shredder," by E. R. Behne.
Technical Communication No. 2—"Rotary Filters for Treatment of Cane Muds," by G. H. Jenkins.
Technical Communication No. 3—"Automatic pH Control," by J. L. Clayton.

News Letter.

In order to provide a means of acquainting mill executives with the progress of experimental work carried out by the Technology Division and current literature not readily available to the mills, a "News Letter" service has been initiated. This News Letter, the first issue of which appeared in June, is to be forwarded to mills intermittently throughout the year, and is expected to provide a further means of contact between the Technology Division and the mills.

Slack Season Research by Mill Officers.

Mr. J. Webster, of Racecourse Mill, and Mr. E. D. Jensen, of the Fairymead Sugar Company, carried out researches into the properties of raw sugar during the past slack season. Mr. Webster investigated the hygroscopic nature of raw sugar, and Mr. Jensen the determination of ash by conductometric methods. Technical Communications embodying the result of their works will be issued shortly.

Seasonal Investigations, 1940.

The fourth annual meeting of the Mill Research Programme Committee was held on 8th April, 1940, during the Conference of the Queensland Society of Sugar Cane Technologists at Mackay. The new Chairman elected to succeed Mr. S. V. Fevre was Mr. M. A. Doolan, of Mulgrave. Mr. W. J. Ryan was elected Secretary.

The programme of investigation for the 1940 season adopted at this meeting is as follows:—

1. *Milling Tests.*

The investigation into the preparation of cane to be extended to include:—

(*a*) Further tests on the National Shredder;
(*b*) The performance of Searby Shredders; and
(*c*) Preparation with knives alone; comparative tests to be made with knives in different positions if practicable.

2. *Conditioning and Storage of Sugar.*

Tests to be conducted in the Mackay District to investigate the possibility of conditioning sugar at the bagging station, to reduce the tendency towards subsequent caking.

Tests to be conducted into the factors which govern the deterioration of sugar in storage.

3. *Crystallization Tests.*

Following the work on crystallization of high-grade massecuites in 1939, the Webre pan to be tested as a means for providing rapid cooling of the massecuite prior to dropping.

4. *Filter Tests.*

Tests to be carried out to determine:

(*a*) The extent to which the operation of plate and frame filters may be improved by the use of filter-aids (especially bagacillo);

(*b*) The optimum filtering cycle for such equipment.

5. *Mill Visits.*

6. *Incidental Work, Unforeseen Work, and the following up of Advices Given.*

Colorimetric pH Standards.

This year standard phenol red colour tubes were forwarded only to those mills which requested them.

Mill Work—1939 Season.

The quantity of cane crushed in the 1939 season exceeded the previous record (established in 1938) by nearly 700,000 tons. The Southern and Central Districts crushed more cane than ever before, whilst in the North the crop was the third highest on record. The cane was of average quality and a record output of raw sugar resulted, the quantity of cane per ton of 94 n.t. sugar (6·77) having been bettered only in 1937.

Crushing rates again increased, whilst extraction and lost juice per cent. fibre both showed an improvement. The Coefficient of Work for 1939 was the highest recorded to date, but both the recovery and boiling-house efficiency were the lowest for a number of years.

Crushing for the 1939 season commenced on the 21st May and continued until 16th January. The first mills to start were Victoria and Macknade and the last to finish Pleystowe and Fairymead. The maximum harvesting period was 218 days at Macknade and the minimum 54 days at Eagleby.

—	Season.	Pol in Cane.	Fibre in Cane.	Purity, 1st Expd. Juice.
		Per cent.	Per cent.	Per cent.
Southern District	1930	14·58	15·00	89·91
	1931	15·01	15·40	88·25
	1932	13·32	15·16	84·95
	1933	13·55	15·21	87·65
	1934	14·67	14·59	89·74
	1935	14·56	14·47	88·60
	1936	15·31	14·32	88·83
	1937	15·05	14·04	88·14
	1938	14·62	13·66	88·87
	1939	14·88	13·70	88·46
Central District	1930	16·80	13·06	91·70
	1931	16·73	12·42	89·93
	1932	16·22	11·99	90·02
	1933	15·40	12·25	90·84
	1934	16·45	12·20	90·82
	1935	16·54	12·36	90·78
	1936	16·43	11·84	90·91
	1937	16·62	10·96	90·06
	1938	16·70	11·55	91·58
	1939	16·33	11·39	90·43
Northern District	1930	15·98	11·38	90·77
	1931	15·56	10·61	89·94
	1932	16·01	10·51	90·11
	1933	14·92	10·27	88·84
	1934	15·16	10·30	89·08
	1935	15·91	11·35	89·63
	1936	15·01	9·92	87·92
	1937	16·14	10·12	89·79
	1938	15·74	10·17	89·95
	1939	16·18	9·84	90·30
All Districts	1930	15·97	12·59	90·90
	1931	15·94	12·28	89·59
	1932	15·90	11·51	89·64
	1933	14·85	12·00	89·40
	1934	15·57	12·23	89·95
	1935	15·84	12·39	89·83
	1936	15·66	11·63	89·36
	1937	16·15	11·17	89·61
	1938	15·84	11·63	90·32
	1939	15·88	11·56	89·85

Tons of Cane per Ton of 94 N.T. Sugar.

1928.	1929.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.
7·18	6·91	6·83	6·94	6·90	7·31	6·97	6·92	6·94	6·73	6·87	6·77

Average Crushing Rates (Tons Cane per Hour).

1933.	1934.	1935.	1936.	1937.	1938.	1939.
45·88	48·92	50·80	54·83	55·73	60·80	63·38

Southern District.

——	1933.	1934.	1935.	1936.	1937.	1938.	1939.
Tons of cane	659,393	817,551	909,223	794,390	647,220	1,035,992	1,262,554
Tons of 94 n.t. sugar	77,229	107,676	117,467	109,142	85,131	135,261	168,896
Tons of cane per ton 94 n.t. sugar	8·538	7·593	7·74	7·28	7·60	7·66	7·48
Pol in cane	13·55	14·67	14·56	15·31	15·05	14·62	14·88
Fibre in cane	15·21	14·59	14·47	14·32	14·04	13·66	13·70
Purity—							
First expressed juice	87·65	89·74	88·6	88·83	88·14	88·87	88·46
Clarified juice	86·88	88·44	87·78	87·57	87·23	88·07	87·80
Syrup	87·38	88·73	88·1	87·97	87·42	88·33	88·22
Gallons molasses per ton cane	4·95	4·02	4·11	4·36	4·91	4·13	4·13
Apparent purity final molasses	40·96	41·24	39·72	40·07	41·23	39·05	38·79
Overall recovery	83·63	85·70	86·08	85·98	83·83	85·46	86·17
Recovery on mixed juice	89·74	89·59	91·995	90·64	87·81	89·82	90·08
Boiling-house efficiency	95·11	96·12	96·94	95·41	92·82	94·55	95·02

Central District.

——	1933.	1934.	1935.	1936.	1937.	1938.	1939.
Tons of cane	1,737,205	1,766,564	1,530,240	1,966,183	1,961,413	2,030,166	2,397,268
Tons of 94 n.t. sugar	249,680	271,437	233,901	301,893	304,502	314,574	371,259
Tons of cane per ton 94 n.t. sugar	6·958	6·508	6·542	6·51	6·44	6·45	6·46
Pol in cane	15·40	16·45	16·54	16·43	16·62	16·70	16·33
Fibre in cane	12·25	12·20	12·36	11·84	10·96	11·55	11·39
Purity—							
First expressed juice	90·84	90·82	90·78	90·91	90·06	91·58	90·43
Clarified juice	90·47	90·42	90·01	90·25	89·55	90·77	89·97
Syrup	90·52	90·41	90·06	90·54	89·84	91·04	90·33
Gallons molasses per ton cane	4·08	3·60	3·91	3·71	4·13	3·72	3·96
Apparent purity final molasses	40·28	38·91	39·52	37·22	35·93	37·85	35·33
Overall recovery	87·44	88·69	88·79	88·62	89·00	88·72	86·98
Recovery on mixed juice	92·38	93·53	93·79	93·20	93·25	92·70	91·20
Boiling-house efficiency	96·26	97·47	97·8	97·08	97·54	96·26	95·20

NORTHERN DISTRICT.

—	1933.	1934.	1935.	1936.	1937.	1938.	1939.
Tons of cane	2,270,430	1,685,876	1,780,804	2,410,638	2,524,301	2,275,927	2,378,999
Tons of 94 n.t. sugar	311,825	233,457	258,958	333,613	373,692	328,301	351,267
Tons of cane per ton 94 n.t. sugar	7·281	7·221	6·877	7·23	6·76	6·93	6·77
Pol in cane	14·92	15·16	15·91	15·01	16·14	15·74	16·18
Fibre in cane	10·27	10·30	11·35	9·92	10·12	10·17	9·84
Purity—							
First expressed juice	88·84	89·08	89·63	87·92	89·79	89·95	90·30
Clarified juice	89·19	89·68	89·96	88·59	90·29	90·07	90·34
Syrup	89·23	89·64	89·89	88·58	89·85	90·89	90·40
Gallons molasses per ton cane	3·65	3·79	3·86	3·94	3·51	3·39	3·56
Apparent purity final molasses	35·21	37·78	36·53	31·66	34·62	34·38	35·81
Overall recovery	87·94	86·80	87·93	88·10	88·01	87·50	86·88
Recovery on mixed juice	92·71	91·62	92·86	92·58	92·44	92·53	91·15
Boiling-house efficiency	97·60	96·34	97·34	97·97	96·80	96·89	95·25

ALL QUEENSLAND DISTRICTS.

—	1933.	1934.	1935.	1936.	1937.	1938.	1939.
Tons of cane	4,667,028	4,269,991	4,220,267	5,171,211	5,132,934	5,342,085	6,038,821
Tons of 94 n.t. sugar	638,734	612,570	610,326	744,648	763,325	778,136	891,422
Tons of cane per ton 94 n.t. sugar	7·307	6·970	6·915	6·94	6·73	6·87	6·77
Pol in cane	14·85	15·57	15·84	15·66	16·15	15·84	15·88
Fibre in cane	12·00	12·23	12·39	11·63	11·17	11·63	11·56
Purity—							
First expressed juice	89·40	89·95	89·83	89·36	89·61	90·32	89·85
Clarified juice	89·25	89·42	89·51	89·07	89·44	89·83	89·48
Syrup	89·41	89·48	89·57	89·27	89·41	90·29	89·77
Gallons molasses per ton cane	4·07	3·76	3·93	3·96	4·02	3·54	3·88
Apparent purity final molasses	38·55	39·20	38·33	35·54	36·62	37·08	36·51
Overall recovery	86·76	87·37	87·8	87·90	87·79	87·52	86·70
Recovery on mixed juice	91·88	92·49	92·98	92·52	92·20	92·01	90·94
Boiling-house efficiency	96·39	96·82	97·36	97·18	96·65	96·14	95·23
Pol extraction	94·43	94·46	94·43	95·01	95·22	95·12	95·34
C.C.S. in cane	13·76	14·485	14·79	14·52	15·00	14·79	14·77
Coefficient of work	98·31	98·41	97·78	99·17	99·13	98·49	99·88

—	1932.	1933.	1934.	1935.	1936.	1937.	1938.	1939.
Crop days	3,276	5,130	4,382	4,296	4,809	4,497	4,822	5,163

FIGURES FOR 1939 SEASON.

—	Northern.	Central.	Southern.	Totals and Averages.
Tons cane crushed	2,378,999*	2,397,268*	1,262,554*	6,038,821*
Tons sugar made (94 n.t.)	351,267*	371,259*	168,896*	891,422*
Net titre	96·88	96·69	96·80	96·78
Tons of cane per ton, 94 n.t. sugar	6·77*	6·46*	7·48*	6·77*
C.C.S. in cane	15·10	15·25	13·70	14·77
Coefficient of work	97·46	101·10	97·63	99·88
Crushing rate	83·74	65·48	48·25	63·38
Lost time, per cent.	1·62	3·39	5·27	3·69
Fibre, per cent. cane	9·84	11·39	13·70	11·56
Pol, per cent. cane	16·18	16·33	14·88	15·88
First expressed juice—				
Brix	21·04	21·60	20·69	21·18
Purity	90·30	90·43	88·46	89·85
Clarified juice—				
Brix	16·99	16·37	15·47	16·31
Purity	90·34	89·97	87·80	89·48
Syrup—				
Brix	67·60	69·01	66·48	67·89
Purity	90·40	90·33	88·22	89·77
Last expressed juice—				
Purity	79·43	79·72	76·59	78·76
Clarified juice per 100 cane	99·66	105·31	104·18	103·17
Dilution, per cent. first expressed juice	23·84	31·95	33·74	29·86
Final bagasse—				
Pol	3·54	3·01	2·32	2·98
Dry substance	50·44	49·12	52·20	50·37
Pol extraction	95·32	95·37	95·66	95·34
Lost cane juice per cent. fibre	46·10	38·61	29·77	38·29
Final molasses—				
Gallons per ton cane	3·56	3·96	4·13	3·88
Brix	84·84	88·18	90·17	87·79
Apparent purity	35·81	35·33	38·79	36·51
True purity	47·81	47·26	46·22	47·10
Reducing sugars	16·31	14·36	10·34	13·75
Final mud—				
Tons per 100 tons cane	3·11	2·98	3·28	3·10
Pol	4·01	2·27	2·80	2·98
Sugar—				
Pol	98·447	98·487	98·656	98·518
Reducing sugars	·391	·343	·192	·319
Ash	·235	·290	·333	·284
Moisture	·443	·344	·279	·358
Dilution indicator	39·910	29·427	26·197	31·851
Pol balance—				
Sugar (recovery)	86·88	86·98	86·17	86·70
Bagasse	4·68	4·63	4·34	4·66
Molasses	4·30	4·95	6·42	5·12
Mud	0·77	0·41	0·62	0·58
Undetermined	3·37	3·03	2·45	2·94
Boiling-house efficiency	95·25	95·20	95·02	95·23
Fuel—				
B.T.U.'s 1,000s. per ton cane—				
Wood	50·10	54·87	168·34	84·81
Coal	..	6·54	1·07	3·06
Molasses	147·02	33·01	0·11	58·21
Bagasse	1,982·67	2,266·42	2,671·24	2,295·41
Total	2,179·79	2,360·84	2,840·76	2,441·49
Crop days	1,621*	1,984*	1,558*	5,163*

*All mills. Remainder except C.S.R., Pioneer, and Inkerman Mills.

CANE MILLED AND SUGAR YIELDS, SEASON 1939.

Mill.	Tons Cane Crushed.	Tons 94 n.t. Sugar Made.	Tons Cane per ton 94 n.t. Sugar. 1939.	Tons Cane per ton 94 n.t. Sugar. 1938.
Mossman	130,063	19,376	6·713	6·678
Hambledon	212,011	31,543	6·721	6·781
Mulgrave	271,008	39,982	6·778	7·012
Babinda	216,711	30,170	7·183	7·209
Goondi	181,315	25,956	6·985	7·072
South Johnstone	254,195	36,906	6·888	7·014
Mourilyan	196,734	29,609	6·644	6·755
Tully	302,594	45,671	6·626	6·734
Victoria	319,297	48,191	6·626	6·839
Macknade	295,071	43,711	6·750	7·075
Sugar—Local Sales	..	152	..	..
Total for Northern District	2,378,999	351,267	6·773	6·932
Invicta	124,200	19,888	6·245	6·268
Pioneer	198,556	32,273	6·152	6·324
Kalamia	243,815	39,547	6·165	6·239
Inkerman	272,024	41,940	6·486	6·678
Proserpine	164,533	25,824	6·371	6·371
Cattle Creek	96,733	14,698	6·581	6·571
Racecourse	242,894	36,535	6·648	6·554
Farleigh	218,942	32,126	6·815	6·587
North Eton	128,010	19,085	6·707	6·771
Marian	230,207	36,586	6·292	6·352
Pleystowe	245,958	38,128	6·451	6·415
Plane Creek	231,396	34,360	6·734	6·428
Sugar—Local Sales	..	269	..	..
Total for Central District	2,397,268	371,259	6·457	6·454
Qunaba	91,127	11,649	7·823	7·981
Millaquin	191,197	25,579	7·475	7·680
Bingera	224,075	30,895	7·253	7·440
Fairymead	231,981	29,898	7·759	8·036
Gin Gin	60,623	7,840	7·733	8·379
Isis	211,836	30,423	6·963	7·464
Maryborough	62,017	7,726	8·027	7·755
Mount Bauple	50,379	6·354	7·929	7·883
Moreton	119,312	16,085	7·418	7·201
Rocky Point	17,711	2,121	8·350	8·072
Eagleby	2,296	221	10·389	9·479
Sugar—Local Sales	..	105	..	..
Total for Southern District	1,262,554	168,896	7·475	7·659

Price: 9d.] By Authority: A. H. TUCKER, Government Printer, Brisbane.